Appendix N
Traffic and Transport Impact Assessment

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Caval Ridge Mine EIS Traffic And Transport Impact Assessment

Prepared for URS Australia Pty Ltd

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1.0 INTRODUCTION

1.1 Project Background

Cardno Eppell Olsen has been commissioned by URS Australia Pty Ltd (URS) to undertake the Traffic and Transport Impact Assessment component of the Environmental Impact Study (EIS) for the proposed Caval Ridge Mine development south of Moranbah. The EIS has been prepared on behalf of the mine operator, BHP Billiton Mitsubishi Alliance (BMA). This assessment has been completed with reference to the conditions specified in the *Bowen Basin Coal Growth Project Draft Terms of Reference* (TOR).

The proposed coal mine is to be located in the north of the Bowen Basin approximately 6km south of Moranbah (measured to northern extent of Mine Lease 1775) and north of the existing Peak Downs Mine. Mackay, the major service centre for the region, is located approximately 190km northeast of the mine site by road. The proposed mine site is connected to Mackay and other towns in the region (e.g. Clermont, Nebo and Eton) via the Peak Downs Highway. It is connected to Moranbah, the most significant residential centre in the vicinity of the mine site, by the Peak Downs Highway and Moranbah Access Road. Refer to Figure A.1 at Appendix A.

For the purpose of completing the Traffic and Transport Impact Assessment, an inspection of the existing road network has been undertaken. In addition to the inspection, extensive data has been sourced from the Department of Main Roads (DMR), Queensland Transport (QT) and Isaac Regional Council (IRC). This includes data relating to traffic volumes, road pavement condition and crashes, as well as information pertaining to future plans for the road network. To supplement the information received from the various government agencies, traffic counts have also been undertaken at a number of intersections in proximity to the mine site and Moranbah.

Information regarding the existing and proposed mining operations with regards to traffic movements has been sourced from BMA.

The Traffic and Transport Impact Assessment addresses the road transport component of the expected mine impacts. Transport impacts by other modes, for example rail, are to be investigated by other technical studies. Further the impacts of the proposed accommodation camp are to be assessed separately as part of the planning application for that development. It is noted, however, that the movement of personnel between the accommodation camp and mine site is addressed as part of this assessment.

1.2 Study Methodology

This study has been carried out in accordance with DMR's *Guidelines for Assessment of Road Impacts of Developments*. These guidelines identify the procedures for assessing the traffic impacts of developments on the external road network. The objective of this assessment is to evaluate the traffic and transport impacts of the proposed Caval Ridge Mine development on the State-controlled and Council-controlled road networks and recommend appropriate mitigation measures.

Traffic impacts include any effects on the traffic operation of intersections and road links in addition to pavement loading impacts. To address these impacts, the following tasks have been undertaken and are discussed in detail in the following sections of the report:

- site inspection of the road network between Alexandra and the proposed development access located approximately 6.5km south-west of the Peak Downs Highway/Moranbah Access Road intersection;
- review of existing road network operations including survey of existing traffic demands;
- forecast traffic generated by the Caval Ridge Mine and assign to surrounding network (including both the construction and operations phases of development);
- consideration of historic growth patterns within the study area;
- consideration of the crash history on adjacent road network;
- estimation of future traffic demands with and without the proposed development with specific account made for traffic demands associated with known planned developments, in particular the proposed Goonyella Riverside Mine expansion and Daunia Mine;
- identification of road network upgrades required to improve network performance or conditions should the Caval Ridge Mine development proceed;
- assessment of the road pavement impacts due to increases in traffic loading generated by heavy vehicles associated with the Caval Ridge Mine.

2.0 PROJECT DESCRIPTION

2.1 Project Overview

The Caval Ridge Mine development is proposed as part of the BMA Bowen Basin Growth Project which also includes the construction of the Daunia Mine and expansion of the Goonyella Riverside Mine. The BMA-prepared *Initial Advice Statement* (IAS) states that the BMA Bowen Basin Growth Project will deliver up to an additional 20 million tonnes per annum (Mtpa). The declaration of the Bowen Basin Growth Project as a 'Significant Project' under the State Development and Public Works Organisation Act 1971 allows for the staged preparation of an EIS for each component of the BMA Bowen Basin Growth Project.

The Caval Ridge Mine component includes the development of a new open cut coal mine which will contribute 5.5 Mtpa to the potential 20 Mtpa increase proposed under the BMA Bowen Basin Growth Project. An additional 2.5 Mtpa is to be produced by the existing Peak Downs Mine and will be processed at the Caval Ridge Mine coal handling and preparation plant (CHPP). This incremental 2.5 Mtpa does not form part of the Caval Ridge Mine assessment as it is within the currently approved output for the Peak Downs Mine, however, the CHPP will be constructed to accommodate this additional output and all associated construction traffic is considered as part of this assessment.

The Caval Ridge Mine has the potential to expand by a further 4 Mtpa, which would form part of a future EIS if production were to increase and include this.

Table 2.1 summarises the key components of the BMA Bowen Basin Growth Project.

Table 2.1 ***BMA Bowen Basin Growth Project: Key Elements***

Project Element	Tonnage Contribution (Mtpa)	Construction Commencement	First Coal	Average Workforce	
				Construction	Operation
Caval Ridge Mine Development	5.5	2011	2013	843*	493*
Daunia Mine Development	4	2009	2010	211*	200*
Goonyella Riverside Expansion	8	2011	2013	542*	700*
Peak Downs Mine Expansion	2.5	-	-	-	-
TOTAL	**20**	**-**	**-**	**-**	**-**

*not consistent with IAS as value is average workforce not total employed workforce, further details provided in later sections regarding assessed workforce breakdown.

2.2 Site Access

It is proposed that access to the Caval Ridge Mine will be achieved via two locations as follows:

- Construction Phase Access – all-movements priority-controlled access to Peak Downs Highway located approximately 3.6km south of the Peak Downs Highway/Winchester Road intersection. This access will service the site during the two year construction phase. Once mining operations commence, this access will be gated and used infrequently by oversized vehicles;
- Operations Phase Access – all-movements priority-controlled access to Peak Downs Highway located approximately 5.1km south of the Peak Downs Highway/Winchester Road intersection. This access will service the Caval Ridge Mine during its 30 year operations phase.

The geometric requirements of the access arrangements are discussed further in following sections of this report.

2.3 Traffic Assessment Scenarios

Traffic volumes associated with the Caval Ridge Mine relate to staff and heavy vehicle movements and vary between the mine construction phase and the mining operations phase. Construction traffic volumes and patterns will be experienced between the start of 2011 and the end of 2012 with mining operations traffic occurring beyond this up to the 30 year project design life.

Traffic operations including intersection capacity requirements have been assessed for the last year of construction, the first year of mine operations and the ten year traffic operations design horizon. Pavement impacts from the increased heavy vehicle traffic have been assessed for the expected project life up. The traffic assessment scenarios and years for the Caval Ridge Mine are therefore:

- 2007/2008 existing traffic volumes;
- 2011 construction commencement;
- 2012 construction completion;
- 2013 mining operations commencement;
- 2023 traffic operations assessment horizon;
- 2043 ultimate design life, pavement assessment horizon.

3.0 ROAD NETWORK

3.1 Peak Downs Highway

The Peak Downs Highway is a State-controlled road which extends approximately 276km from Mackay to Clermont. It functions as a major link within Isaac Regional Council providing the primary road connection between a number of townships and mines within Central Queensland and the regional hub of Mackay.

For the purpose of this report, the Peak Downs Highway has been divided into shorter sections, shown on Figure A.2 at Appendix A. These road sections mirror divisions already established by DMR. All chainage/distances mentioned in this report are as per DMR documentation. These sections are described below.

3.1.1 Section 1: Peak Downs Highway, Mackay – Walkerston

The section of the Peak Downs Highway from the Bruce Highway to the Eungella Road intersection at Walkerston is 6.47km in length. This roadway is generally a two lane, undivided, sealed road with a seal width of 11.0m. The speed limit of the road is predominantly 100km/hr. At the intersection with the Bruce Highway the speed limit is 60km/hr and gradually increasing to a posted 100km/hr speed limit as the highway leaves Mackay.

This road section is a designated 25m B-Double route.

3.1.2 Section 2: Peak Downs Highway, Walkerston – Eton

This section of the Peak Downs Highway commences at the Eungella Road intersection and continues until the intersection with Marion-Eton Road in Eton, a total length of 18.75km. This section of the highway passes through the towns of Walkerston and Eton, with a reduced speed limit through the residential areas. Outside of the towns, the roadway is generally a two lane, undivided, sealed road with a seal width of 10.0m.

In addition to the standard 60km/hr speed limit for the urban areas of Walkerston and Eton, the roadway passes through a 40km/hr school zone in the centre of Walkerston. Outside of the towns, the signed speed limit for the road is 100km/hr.

This road section is a designated 25m B-Double route.

3.1.3 Section 3: Peak Downs Highway, Eton - Nebo

This section of road starts at the intersection with Marion-Eton Road and finishes at the intersection with Reynolds Street in Nebo. It has a length of 62.74km and is generally a sealed, undivided two lane road. The seal width along this section varies between 6.8m and 10.0m.

There are a number of overtaking lanes within this section of roadway. There are six overtaking lanes in the westbound direction and five overtaking lanes in the eastbound direction. These are the only overtaking lanes on the Peak Downs Highway between Mackay and Moranbah.

The general speed limit for this section of road is 100km/hr. However, approximately 15km from Eton the speed reduces to 60km/hr to allow for a sharp bend at the bridge over Black Waterhole Creek, before returning to 100km/hr. The speed also gradually decreases to 60km/hr on the approach to Nebo.

The final 45km towards Nebo is a designated Type 1 Road Train route.

3.1.4 Section 4: Peak Downs Highway, Nebo – Moranbah

This section of road commences at the Reynolds Street intersection in Nebo and finishes at the intersection with Moranbah Access Road. It has a length of 87.54km. It is generally a sealed, undivided two lane road with an average seal width of 9.0m. There are no overtaking lanes within this section of roadway.

The speed limit at Reynolds Street is 80km/hr and it gradually increases to 100km/hr for the remainder of the section.

This section is a designated Type 1 Road Train route.

3.1.5 Section 5: Peak Downs Highway, Moranbah – Clermont

The section of the Peak Downs Highway from the Moranbah Access Road to the Fitzroy Development Road intersection is 89.5km in length. It is generally a sealed, undivided two lane road with an average seal width of 9.0m.

The speed limit of the road is predominantly 100km/hr, except through towns where it reduces accordingly.

This section is a designated Type 1 Road Train route.

3.2 Moranbah Access Road

Moranbah Access Road runs from the Peak Downs Highway to the intersection with Mills Avenue in Moranbah and is the sole access route between the town and the highway. The road is approximately 12km long and is an undivided, sealed, two lane road with sealed shoulders. There are no overtaking lanes on this road.

The posted speed limit is 100km/hr for approximately 11km from the intersection with the Peak Downs Highway. The speed limit then gradually decreases until it becomes 60km/hr in Moranbah.

3.3 School Bus Routes

There are currently two school bus routes that use Peak Downs Highway to access the schools in Moranbah from Clermont and Coppabella. There are no school bus stops along the Caval Ridge Mine site frontage. It is not expected that these school bus routes will be significantly impacted on by the additional traffic associated by the project. School start and end times do not correspond with the start and end of mine shifts and the volumes of goods deliveries is anticipated to be low and spread throughout the day.

3.4 Road Crash History

Crash data for the Peak Downs Highway has been obtained from Queensland Transport. The crash data available considered reported crashes over a five year period from June 2001 to June 2006.

The location of each crash is shown on Figure A.3 at Appendix A. Table 3.1 summarises the reported crashes by severity.

Table 3.1 Summary of Peak Downs Highway Crash Statistics (2001-2006)

Crash Severity	Number of Crashes	%
Fatal	8	5%
Hospitalisation	45	27%
Medical treatment	30	18%
Minor injury	29	17%
Property damage	54	33%
TOTAL	**166**	**100%**

Investigations reveal that 64% of crashes involved a single vehicle and that 84% of crashes occurred at mid-block locations. The high proportion of these crash types indicates that driver fatigue may be a significant contributing factor to the observed crashes. However, this trend is consistent with a rural road environment. Analysis also indicates that 22% of crashes occur at unlit locations during the night.

No pronounced weekly patterns were observed in the crash data therefore the crash history cannot be readily attributed to mine roster start and end days.

Discussions with DMR raised concern about driver fatigue, particularly relating to workers finishing a 12-hour shift and then driving back to Mackay. An inspection of Peak Downs Highway revealed that a number of fatigue measures have already been implemented along this road, including audible edge line delineation along most of the route, “Driver Reviver” signage and regular rest areas. Further efforts to combat driver fatigue should probably be considered from a staff management perspective, for example, the potential to provide a bus service to Mackay.

3.5 Scheduled Road Improvement Projects

DMR's *Roads Implementation Program 2008-09 to 2012-13* (RIP) has been reviewed to determine the proposed upgrades to the sections of the road network expected to be used by the Caval Ridge Mine traffic. This program was prepared in 2008 and hence some projects (programmed for 2008/2009) may have already been completed. Proposed projects on Peak Downs Highway between Clermont and Nebo include isolated pavement reconstruction, rehabilitation and seal widening works as well as driver fatigue measures. No upgrading works are detailed in the RIP for the study intersections as defined in Section 5.2.

It is understood, however, that DMR is currently in discussions with another development proponent regarding potential upgrades at the Peak Downs Highway/Moranbah Access intersection. Due to the preliminary nature of these discussions, DMR was unable to provide any advice as to the potential extent of upgrades at that intersection. It is recommended that the potential for cost sharing with other development proponents be investigated should any infrastructure contribution negotiations be required with DMR.

4.0 BACKGROUND TRAFFIC

4.1 Existing Traffic Volumes

Existing intersection movement volumes have been identified from traffic surveys undertaken by Austraffic on either Wednesday 9 July 2008 or Thursday 10 July 2008 at the following locations:

- Peak Downs Highway/Winchester Road;
- Peak Downs Highway/Moranbah Access Road;
- Moranbah Access Road/Mills Avenue.

Average Annual Daily Traffic (AADT) traffic volumes have been identified from 2007 permanent count station data supplied by the Department of Main Roads Mackay/Whitsunday and Fitzroy Regions for the following roads:

- Peak Downs Highway (33A & 33B);
- Marlborough-Sarina Road (514 & 512).

Average Daily Traffic (ADT) traffic volumes have been estimated from 2008 manual counts (13/14 hour observation period) factored based on 2003 ADT data provided by Isaac Regional Council for the following roads:

- Moranbah Access Road;
- Winchester Road (also known as Saraji-Dysart Road, Peak Downs Mine Road and Dysart Road);
- Railway Road.

The reviewed traffic survey data indicates that the AM and PM network peak periods typically occur in the hour ending 7:15AM and 6:15 PM respectively. This is consistent with mine shift start and end times and reflects the influence of mining activity on traffic patterns in the area.

Traffic volumes for 2008 AM peak periods, 2008 PM peak periods and 2007 daily averages are shown on Figures A.4 – A.6 at Appendix A.

4.2 Historic Traffic Growth

The observed traffic growth on key surrounding roads has varied widely dependent on proximity to Mackay and the observation period, with generally higher growth observed in recent years. The following ranges of traffic growth have been observed:

- Peak Downs Highway 3% p.a. to 17% p.a.;
- Marlborough-Sarina Road 2% p.a. to 18% p.a.;
- Moranbah Access Road 11% p.a.

4.3 Background Traffic Growth

DMR officers advised during prelodgement discussions that the following growth rates should be adopted when estimating future background traffic volumes. Officers acknowledged during discussions that these growth rates were unlikely to be sustained over a prolonged period:

- Mine access to Eton 10% p.a. compound;
- Eton to Walkerston 5% p.a. compound;
- Walkerston to Alexandria 5% p.a. compound.

The stipulated growth rates exclude specific allowances for background traffic associated with the proposed Goonyella Riverside Mine expansion and Daunia Mine development. Traffic generated by these sites is considered as part of the Background scenario in addition to the annual percentage growth.

Two traffic growth periods have been adopted for this assessment. These periods are 2007 to 2021 and 2022 to 2041.

The use of the DMR recommended growth rates for the initial 14 year period from 2007 to 2021 is considered a reasonable approach given recent growth observations. These rates have therefore been adopted for both the traffic operations impact assessment and the pavement impact assessment for the period 2007-2021.

However, it is considered extremely unlikely that the DMR growth rates will continue beyond 2021. The use of such rates results in the doubling of existing demands every seven years, or a 31-fold increase beyond current traffic demands by 2043. The following assessment traffic growth rates have therefore been assumed for both the traffic operations and pavement impact assessments:

2007 to 2021:

- Peak Downs Highway (mine access to Eton) 10% p.a. compound;
- Peak Downs Highway (Eton to Walkerston) 5% p.a. compound;
- Peak Downs Highway (Walkerston to Alexandria) 5% p.a. compound;
- Marlborough-Sarina Road 5% p.a. compound;
- Winchester Road 10% p.a. compound;
- Moranbah Access Road 10% p.a. compound.

2022 to 2043:

- Peak Downs Highway (mine access to Eton) 5% p.a. compound;
- Peak Downs Highway (Eton to Walkerston) 3% p.a. compound;
- Peak Downs Highway (Walkerston to Alexandria) 3% p.a. compound;
- Marlborough-Sarina Road 5% p.a. compound;
- Winchester Road 5% p.a. compound;
- Moranbah Access Road 5% p.a. compound.

The use of compounding rates of 3% - 5% p.a. for the period 2022-2043 is considered conservative given the large 2021 base to which the growth is applied. The adoption of lower background growth rates will also result in the development's heavy vehicle traffic contributing a larger proportion and hence higher maintenance cost compared to the background traffic flows.

The assessment background traffic growth rates exclude allowances made for traffic generated by the proposed Daunia Mine development and Goonyella Riverside Mine expansion. These allowances were based on preliminary data and are generally of a similar level to the traffic generated by the Caval Ridge Mine, proportional to expected coal production. This traffic is additional to the background traffic volumes.

5.0 PROJECT TRAFFIC GENERATION

5.1 Construction Phase

5.1.1 Construction Assumptions

Construction of the proposed Caval Ridge Mine is expected to commence in early 2011 and be completed by the end of 2012. BMA has advised that during the construction period there will be an average workforce of 843 staff with a maximum workforce of 1,400 staff during the peak six months. This workforce includes the industrial area and mine construction teams who are anticipated to work one shift (7am – 6pm) and two shifts (7am – 7pm, 7pm – 7am) seven days a week respectively. The anticipated split between the day/night construction shifts has been accounted for in this assessment.

It has been assumed for this assessment that the end of the industrial and mine construction teams' day shifts would coincide although they are anticipated to actually be offset by one hour. This assumption allows greater shift scheduling flexibility and is considered conservative as it results in worse case traffic operations.

It has been assumed that the delivery of materials and the removal of wastes will occur five days a week with 10% of daily movements occurring during each assessed peak hour period. No site materials such as overburden are proposed to be relocated via the external road network during the construction phase.

Given the location of the development and that Moranbah is unable to house the planned staff numbers, it is proposed that all construction personnel reside in a dedicated accommodation camp south of Moranbah. For the purposes of this assessment, the construction camp has been assumed to be accessed from Moranbah Access Road.

It has been assumed that 80% of staff travelling to site will utilise a private bus service (assumed occupancy of 48) while the remaining 20% of staff will utilise private vehicle (assumed occupancy of two). It has also been assumed that the movement of buses will be coordinated with staff shifts such that buses always travel loaded. All staff are assumed to arrive/depart the site during the assessed peak periods.

No account has been made in the assessment for the movement of staff between the accommodation camp and other regional centres such as Mackay at the start and end of recreational periods. It is understood that the impacts of these movements will be assessed as part of a separate planning application for the accommodation camp development.

5.1.2 Construction Phase Heavy Vehicle Demands

The heavy vehicle traffic generated during the construction phase for the Caval Ridge Mine are anticipated to be entirely associated with the delivery of construction materials, the removal of wastes and the transportation of staff. Table 5.1 summarises the expected type and quantity of heavy vehicle movements during the construction phase excluding bus movements associated with staff transport. Within the two year construction phase is a six month period of peak activity. The delivery of some material types will be made entirely within the peak six month period.

During the construction phase, it is anticipated that there will be an average of approximately 5,128 two-way bus movements per annum and a maximum of approximately 23 two-way bus movements per day during the peak six month construction period.

Table 5.1 ***Caval Ridge Mine Construction Phase Deliveries***

Material	Origin/ Destination	Heavy Vehicle Volume (two-way)					
		Total Construction Requirement	Annual Construction Requirement	Transport Vehicle	Total Construction Deliveries	Average Annual Construction Deliveries	Peak 6 Month Construction Deliveries
Construction Inputs							
Stockyard Equipment	Mackay	2,523 T	1,262 T	Single Articulated	126	63	126
Base and Sub-base materials	Dysart	360,000 T	180,000 T	Type 1 Road Train	7,200	3,600	3,900
Concrete	Moranbah	50,400 T	25,200 T	Concrete Transit Vehicle	4,200	2,100	1,800
Structural Steel	Mackay	3,500 T	1,750 T	Single Articulated	175	88	125
Mechanical Steel	Mackay	825 T	412.5 T	Single Articulated	41	21	26
Pipe work - Steel	Mackay	554 T	277 T	Single Articulated	28	14	28
Pipe work - Steel with Lining	Mackay	826 T	413 T	Single Articulated	41	21	41
Pipe work - PE	Mackay	866 T	433 T	Single Articulated	43	22	33
Electrical Reticulation Cable	Mackay	134 T	67 T	Single Articulated	7	3	7
Electrical Reticulation - Poles	Mackay	700 T	350 T	Single Articulated	35	18	35
Conveyor Belts	Mackay	337 T	168.5 T	Single Articulated	17	8	17

Table Cont…

Material	Origin/ Destination	Heavy Vehicle Volume (two-way)					
		Total Construction Requirement	Annual Construction Requirement	Transport Vehicle	Total Construction Deliveries	Average Annual Construction Deliveries	Peak 6 Month Construction Deliveries
Construction Phase Inputs							
Pumps & Compressors	Mackay	1,400 T	700 T	Single Articulated	70	35	65
Process Equipment	Mackay	600 T	300 T	Single Articulated	30	15	30
Other Equipment	Mackay	1,200 T	600 T	Single Articulated	60	30	50
Asphalt	Mackay	600 T	300 T	Single Articulated	30	15	15
Bulk Bitumen - Polymer Modified	Mackay	282 T	141 T	Single Articulated	14	7	10
Aggregates	Dysart	5,200 T	2,600 T	Single Articulated	260	130	182
Prefabricated Buildings - Admin	Mackay	940 T	470 T	Single Articulated	47	24	47
Prefabricated Buildings - Bathhouse	Mackay	420 T	210 T	Single Articulated	21	11	21
Prefabricated Buildings - First Aid	Mackay	40 T	20	Single Articulated	2	1	2
Prefabricated Buildings - Rescue	Mackay	60 T	30 T	Single Articulated	3	2	3
Prefabricated Buildings - Gatehouse	Mackay	20 T	10 T	Single Articulated	1	1	1
Prefabricated Buildings - Offices	Clermont	400 T	200 T	Single Articulated	20	10	20
Prefabricated Buildings - Facilities	Mackay	200 T	100 T	Single Articulated	10	5	10
Fuel	Mackay	17,164 kL	8,582 T	27m B-Double	301	151	151
Miscellaneous	Mackay	215 T	108 T	Two Axle Truck	43	21	21
TOTAL	**-**	**449,406T**	**224,703T**	**-**	**12,825**	**6,413**	**6,766**

Table Cont…

Material	Origin/ Destination	Heavy Vehicle Volume (two-way)					
		Total Construction Requirement	Annual Construction Requirement	Transport Vehicle	Total Construction Deliveries	Average Annual Construction Deliveries	Peak 6 Month Construction Deliveries
Construction Phase Outputs							
Waste Oil + Sludge + Grease	Mackay	2.5 kL	1.3 T	Single Articulated	<1.0	<1.0	<1.0
Hydraulic Fluid	Mackay	1.0 kL	0.5 T	Single Articulated	<1.0	<1.0	<1.0
General and Recyclable Waste	Moranbah	50 T	25 T	Single Articulated	2.5	1.2	1
Hydraulic Hoses	Mackay	20 T	10 T	Single Articulated	<1.0	1.0	1
Scrap Metal	Mackay	4 T	2 T	Single Articulated	<1.0	<1.0	<1.0
Oil Filters	Mackay	20 T	10 T	Single Articulated	1.0	<1.0	1
Septic	Moranbah	2,738 kL	1,369 T	Single Articulated	274	137	137
TOTAL	**-**	**2,835 T**	**1,418 T**	**-**	**279**	**139**	**139**
TOTAL (INPUTS & OUTPUTS)	**-**	**452,240T**	**226,120T**	**-**	**13,104**	**6,552**	**6,905**

5.1.3 Construction Phase Light Vehicle Demands

It is anticipated that light vehicle demands to the Caval Ridge Mine during the construction phase will be entirely associated with employee movements and that, as previously stated, 20% of staff will travel to the site via private vehicles (assumed occupancy of two). It is therefore estimated that there will be 140 two-way private vehicle movements associated with the site during the peak six month construction period.

5.1.4 Construction Phase Traffic

The key transport routes to be used by construction traffic are shown on Figure A.7 at Appendix A. Traffic volumes associated with the construction phase alone (i.e. disregarding existing highway traffic) are shown for AM peak hour activities, PM peak hour activities and total daily activities on Figures A.8 – A.10 at Appendix A.

5.2 Operations Phase

5.2.1 Operations Assumptions

The Caval Ridge Mine is anticipated to commence mining operations at the start of 2013 with a 30-year project life. The vehicle movements generated during the operations phase are anticipated to be entirely associated with the delivery of consumables, removal of wastes and the transportation of staff. The refined product is to be transported via rail to Mackay for distribution and will not generate any external road traffic demands. It has been assumed that the delivery of material and the removal of waste will occur five days a week with 10% of daily movements occurring during each assessed peak hour period. No operations ramp-up period following construction has been assumed.

BMA has advised that during mining operations there will be an average workforce of 493 staff. The site will operate 24 hours a day, seven days a week with two daily 12 hour shifts starting at 7:00am and 7:00pm. BMA anticipates that 95% of operations staff will be accommodated in Moranbah and the remaining 5% in Dysart.

It is expected that 70% of operations staff accommodated in Moranbah will travel to the site via a private bus service (assumed occupancy of 48) while the remaining 30% will travel via private vehicle (assumed single occupancy). It is anticipated that 100% of staff housed in Dysart will travel to the subject site via private vehicle (assumed single occupancy). It has been assumed that the bus service will be coordinated with the start and end of shifts such that all services travel loaded (i.e. a bus arriving with workers for shift start will then depart with workers from the finishing shift). All staff are assumed to arrive and depart during the assessed peak hour periods.

No account has been made in the assessment for the movement of staff between Moranbah/Dysart and surrounding regional centres such as Mackay at the start and end of recreational periods.

It is anticipated that the mine will shut down for maintenance on occasion. During this time, mining operations will cease and there will be fewer staff onsite as compared to during normal mining operations. The number of light vehicle trips generated by the mine during maintenance periods is therefore expected to be much lower than during normal operation periods. However, maintenance activities could generate a small increase in heavy vehicle movements. Such occurrences are anticipated to be infrequent and generally of lower volume than the worst case assessed in this report. As such, the impacts of these maintenance periods have not been explicitly addressed.

5.2.2 Operation Phase Heavy Vehicle Demands

During mining operations the Caval Ridge Mine is anticipated to generate heavy vehicle movements associated entirely with the delivery of mine consumables, removal of wastes and transportation of staff. Table 5.2 summarises the expected type and quantity of heavy vehicle movements during the construction phase excluding bus movements associated with staff transport.

During the mining operations phase, it is anticipated that there will be approximately 2,493 two-way bus movements per annum to/from the subject site with an average of seven two-way bus movements per day.

Table 5.2 ***Caval Ridge Mine Operations Phase Deliveries***

Material	Origin / Destination	Heavy Vehicle Volume (two-way)			
		Annual Operations Requirement	Transport Vehicle	Annual Deliveries	Average Daily Deliveries
Operation Phase Inputs					
Fuel	Mackay	25,000 kL	27m B-Double	439	2
Explosives	Dysart	14,000 T	Single Articulated	700	3
General freight	Mackay	1,650 T	Single Articulated	83	<1.0
Oil	Mackay	99 kL	27m B-Double	3	<1.0
Fuel Additive	Mackay	3.3 kL	2 Axle Truck	1	<1.0
INPUT TOTAL	**-**	**≈ 40,752 T**	**-**	**1,225**	**5**
Operation Phase Outputs					
Waste Oil, Sludge & Grease	Mackay	1,079 kL	Single Articulated	54	<1.0
Hydraulic Fluid	Mackay	439 kL	Single Articulated	22	<1.0
General and Recyclable Waste	Moranbah	6,555 T	Single Articulated	328	1
Hydraulic Hoses	Mackay	215 T	Single Articulated	11	<1.0
Scrap Metal	Mackay	1,161 T	Single Articulated	58	<1.0
Oil filters	Mackay	48 T	Single Articulated	2	<1.0
OUTPUT TOTAL	**-**	**≈ 9,497 T**	**-**	**475**	**2**
TOTAL (INPUT & OUTPUT)	**-**	**≈ 50,249 T**	**-**	**1,700**	**7**

5.2.3 Operations Phase Light Vehicle Demands

It is anticipated that light vehicle traffic demands to the Caval Ridge Mine during the operations mining phase will be limited to employee movements. BMA anticipates that 95% of the operational employees will be accommodated in Moranbah, of which it has been assumed 30% will travel to the site via private vehicle (assumed single occupancy). The remaining 5% of operational staff are anticipated to be housed in Dysart with all commuting to the site via private vehicle (assumed single occupancy).

Based on the above assumptions, it is anticipated that during normal operations there will be 165 two-way private vehicle movements associated with the Caval Ridge Mine.

5.2.4 Operations Phase Traffic

The key transport routes to be used by operations traffic are shown in on Figure A.7 at Appendix A. Traffic associated with the mining operations phase alone (i.e. disregarding existing highway traffic) are shown for AM peak hour activities, PM peak hour activities and total daily activities in Figures A.11 – A.13 at Appendix A.

5.3. Heavy Vehicle Summary

Table 5.3 summarises the anticipated heavy vehicle generation of Caval Ridge Mine on an annual basis during both the mine construction and mining operations phases. This information forms the basis of the pavement impact assessment undertaken for this project.

Table 5.3 ***Annualised Caval Ridge Mine Heavy Vehicle Movements***

Project Phase		**Annual Delivery Scale (T)**	**Annual Deliveries**
Construction	Input	≈ 449,406	6,413
	Output	≈ 2,835	139
	TOTAL	**≈ 452,240**	**6,552**
Operations	Input	≈ 40,752	1,225
	Output	≈ 9,497	475
	TOTAL	**≈ 50,249**	**1,700**

6.0 TRAFFIC IMPACT ASSESSMENT

6.1 Traffic Impact Assessment

The traffic operation of the external road network during the construction phase has been conservatively assessed for the peak six month activity period. It is anticipated that, during the mining operations phase, mining activity will be generally constant and therefore average traffic operations have been assessed during that phase.

6.2 Assessment Network Volumes

As previously stated, the Caval Ridge Mine is anticipated to generate peak traffic demands between 6:30am – 7:30am and 6:30pm – 7:30pm. Review of the traffic survey data indicates that the road network peaks in the vicinity of the proposed Caval Ridge Mine generally occur between 6:15am – 7:15am and 5:15pm – 6:15pm.

For the purposes of the assessment, it has conservatively been assumed that the road network peak periods and mine's peak traffic generation periods would coincide. This assumption is conservative and provides assurance to DMR and IRC that, irrespective of eventual shift times, the traffic operation of the road network should be no worse than reported.

Review of the traffic survey data indicates that network volumes during the mine's anticipated peak AM traffic generation period (i.e. 6:30am – 7:30am) are generally 85% – 87% of that observed during the network AM peak period (i.e. 6:15am – 7:15am). Further, the survey data indicates that network volumes during the mine's anticipated peak PM traffic generation period are generally 49% – 60% of that observed during the network PM peak period.

6.3 Investigation Scope and Assessment Scenarios

DMR's *Guidelines for the Assessment of Road Impacts of Development* states that traffic operations need to be considered for all State-controlled intersections where the construction or operational traffic generated by a proposed development equals or exceeds 5% of the existing AADT for any intersection movement or mid-block volume. This stipulated methodology has also been utilised to determine the assessment scope for Council-controlled assets consistent with advice provided by Isaac Regional Council officers.

In accordance with DMR's scoping guidelines, Caval Ridge Mine's impact on the following intersections has been considered:

- Peak Downs Highway/Mine Site construction phase access;
- Peak Downs Highway/Mine Site operation phase access;
- Peak Downs Highway/Winchester Road;
- Peak Downs Highway/Moranbah Access Road.

It is noted that the Railway Station Road/Moranbah Access Road intersection may fall within the 5% assessment scope, however, it has not been assessed as part of this study. It is understood that an operational assessment of this intersection will be undertaken separately as part of the planning application for the proposed accommodation camp if warranted.

This assessment scope includes all significant intersections at which the proposed development (construction or mining operations phases) is anticipated to increase any movement volume by 5% or more beyond existing (2008) survey volumes. The use of existing volumes as opposed to future background volumes to define the extent of investigations ensures that the scope is independent of the assumed background growth rate. Use of existing volumes is also consistent with DMR's assessment guidelines.

Due to limited data, the scope of the intersection operations investigation was defined based on peak hour volumes not AADT volumes which is not strictly consistent with DMR's scoping guidelines. Use of peak hour volumes to define the scope is, however, considered appropriate as intersection capacity requirements are dictated by peak period volumes not AADT volumes.

Traffic conditions have been assessed for the year 2012, which is the anticipated last year of construction, 2013 the year operations commence and 2023 which represents the 10 year traffic design horizon post completion. For all assessment years, analysis has been completed for both the with and without Caval Ridge Mine traffic scenarios. This is so that the marginal impact of the proposed development on the State and Council-controlled road networks can be determined.

Traffic volumes forecast for 2012, 2013 and 2023 with and without the Caval Ridge Mine traffic are shown on Figures A.14 – A.31 inclusive at Appendix A. Figures A.32 – A.37 inclusive at Appendix A indicate where the construction and operation traffic volumes exceed 5% of the existing traffic volumes for the AM and PM peak hours and the daily traffic volumes. These locations are where the Caval Ridge Mine is considered to have a 'significant' impact on the adjacent road network.

6.4 Intersection Impacts

The traffic operation of each study intersection has been analysed with and without development using SIDRA Intersection 3.2 referred to herein as SIDRA. This program calculates the operation of intersections based on input parameters, including geometry and traffic volumes. As an output, SIDRA provides estimates for the degree of saturation (DOS), queues and delays.

In the *Guidelines for Assessment of Road Impacts of Development*, DMR defines the following standard DOS thresholds:

- priority-controlled intersections 0.80;
- roundabouts 0.85;
- signalised intersections 0.90.

The DMR guidelines note that a DOS exceeding these values indicates that an intersection is nearing its practical capacity and upgrade works may be required. Above these threshold values, users of the intersection are likely to experience rapidly increasing delays and queuing.

Importantly, it is noted that DOS is not the only performance indicator and that other measures such as average delay for the critical movement should also be reviewed when assessing the traffic operations of an intersection.

The traffic operation of existing intersections is discussed in the following sections as are potential upgrades to mitigate development impacts where appropriate.

6.5 Construction Phase Site Access/Peak Downs Highway

It is proposed that a priority-controlled access off the Peak Downs Highway be constructed to service the Caval Ridge Mine during the two year construction phase. Once mining operations commence, this access is to be gated and used infrequently by oversized vehicles. Analysis of this intersection has only been undertaken for the mine construction phase as assessment during the mining operations phase is not warranted due to the anticipated low/infrequent vehicle volumes.

For the purposes of the traffic assessment, it has been assumed that the intersection would comprise short protected turn lanes on both approaches of the Peak Downs Highway. It is understood that BMA's Engineers and DMR have already agreed to the design parameters for this location subject to an operational assessment.

The SIDRA intersection layout used for analysis is provided on Figure 6.1 and a summary of the analysis outputs for this form is detailed in Table 6.1. The assessed form is indicative with nominal short lane lengths assumed, the appropriateness and feasibility of which should be confirmed by further geometric design and civil engineering investigations. Table 6.1 summarises the DOS, critical delay and 95%ile queue for the critical movement for each reported performance measure.

Figure 6.1 ***Construction Phase Site Access/Peak Downs Highway Intersection Layout – Proposed Form***

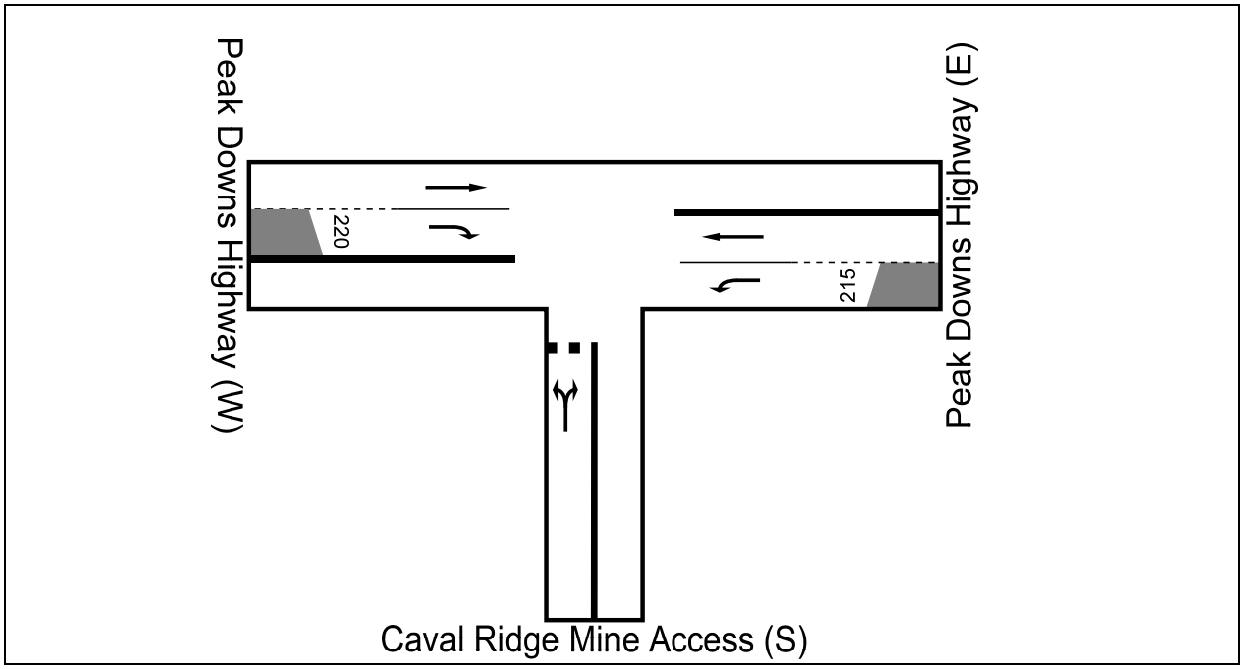


Table 6.1 ***Construction Phase Site Access/Peak Downs Highway Proposed Form - SIDRA Analysis Summary***

Scenarios	AM Peak			PM Peak		
	DOS	Critical Delay	95th %le Queue	DOS	Critical Delay	95th %le Queue
2012 With Development	0.10	11	1	0.23	10	8

Table 6.1 confirms that the proposed access form is expected to operate at an acceptable level for the assessed construction phase scenario. The proposed access form is therefore considered appropriate from a traffic operations perspective. The proponent's civil engineer should undertake further investigations to refine the geometric design of the intersection consistent with the parameters agreed to with DMR.

6.6 Operations Phase Site Access/Peak Downs Highway

As detailed earlier it is proposed that a priority-controlled access to the Peak Downs Highway be constructed to service the Caval Ridge Mine during its 30 year mining operations phase.

For the purposes of this traffic assessment, it has been assumed that the intersection would comprise short protected turn lanes on both approaches of the Peak Downs Highway. It is understood that the BMA's Engineers and DMR have already agreed to the design parameters for this location subject to an operational assessment.

The SIDRA intersection layout used for analysis is provided on Figure 6.2 and a summary of the analysis outputs for this form is detailed in Table 6.2. It is noted that Table 6.2 reports the DOS, critical delay and 95%ile queue for the critical right turn movement from the southern mine access approach to the eastern Peak Downs Highway approach.

Figure 6.2 ***Operations Phase Site Access/Peak Downs Highway Intersection Layout – Proposed Form***

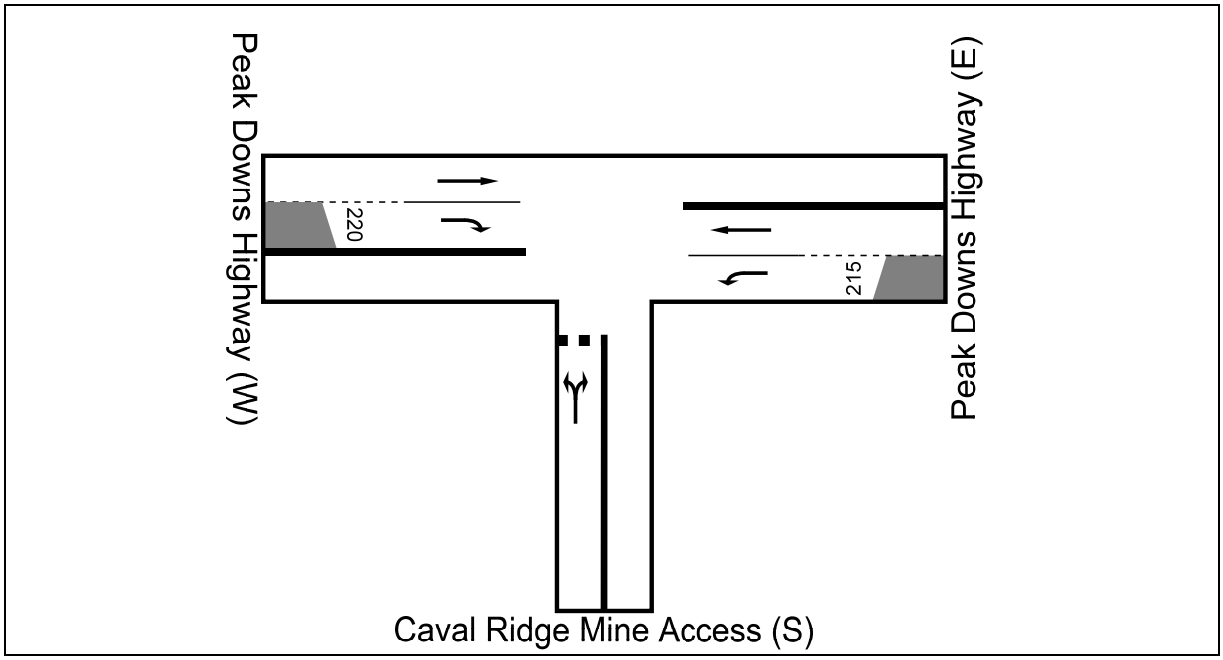


Table 6.2 ***Operations Phase Site Access/Peak Downs Highway Proposed Form - SIDRA Analysis Summary***

Scenarios	AM Peak			PM Peak		
	DOS	Critical Delay	95th %le Queue	DOS	Critical Delay	95th %le Queue
2023 With Development	0.14	10	4	0.14	11	4

The proposed access form is expected to operate at an acceptable level for all operational scenarios assessed. The proposed form is therefore considered appropriate from a traffic operations perspective. The proponent's civil engineer should undertake further investigations to refine the geometric design of the subject intersection consistent with the parameters agreed to with DMR.

6.7 Winchester Road/Peak Downs Highway

The Winchester Road/Peak Downs Highway intersection is currently priority-controlled and constructed to an Austroads BAR/AUL standard on the Peak Downs Highway approaches and an Austroads BA standard on the Winchester Road approach. Caval Ridge Mine will generate additional through traffic at this intersection although only minor additional turning traffic.

6.7.1 Existing Intersection Form

The SIDRA intersection layout used for analysis is provided on Figure 6.3 and a summary of the analysis results for this form is detailed in Table 6.3. It is noted that Table 6.3 reports the DOS, critical delay and 95%ile queue for the critical movement for each reported performance measure.

Figure 6.3 ***Winchester Road/Peak Downs Highway Intersection Layout – Existing Form***

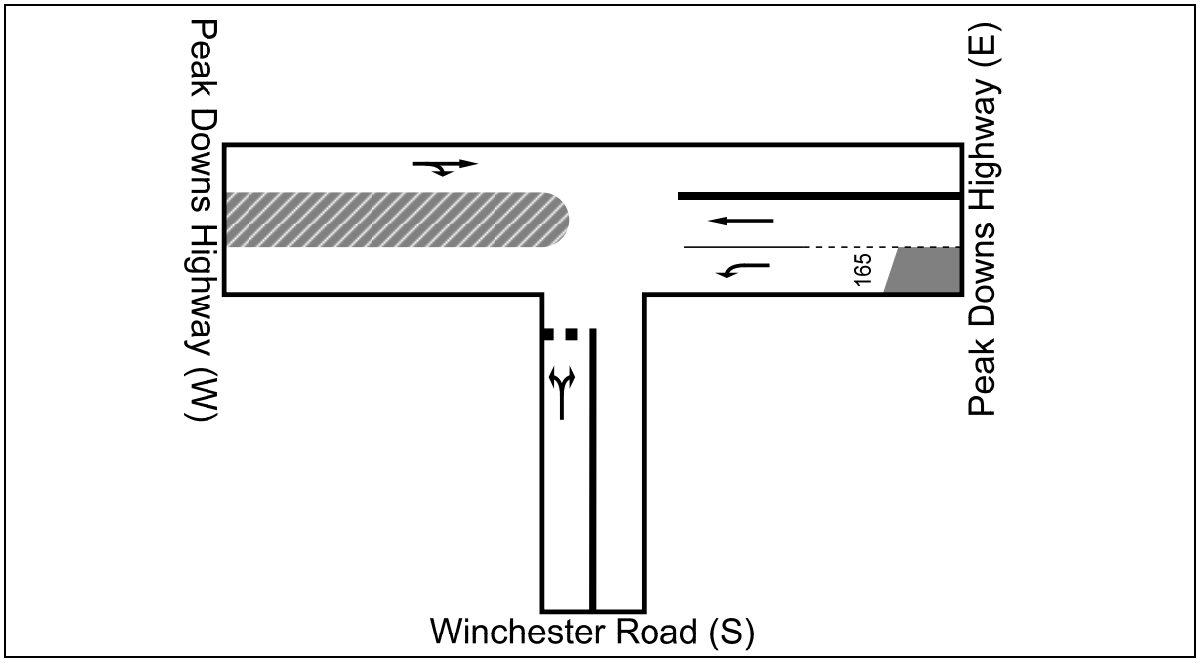


Table 6.3 ***Winchester Road/Peak Downs Highway***
Existing Form - SIDRA Analysis Summary

Scenarios	AM Peak			PM Peak		
	DOS	Critical Delay	95th %le Queue	DOS	Critical Delay	95th %le Queue
2012 Background	0.21	10	8	0.28	10	12
2012 With Development	0.26	12	10	0.38	12	17
2013 Background	0.33	11	11	0.40	11	18
2013 With Development	0.36	13	17	0.49	13	28
2023 Background	1.00	27	108	1.08	107	463
2023 With Development	1.11	132	363	1.35	337	1,035

This intersection is anticipated to operate outside DMR's standard DOS performance criteria prior to 2023 during peak periods irrespective of the Caval Ridge Mine being developed.

Further analysis indicates that this intersection will fail to meet DMR's standard DOS performance criteria in 2019 even without the Caval Ridge Mine not proceed based on the assumed conservative (high) background traffic growth.

It is estimated that if the Caval Ridge Mine proceeds, this intersection will fail to meet DMR's standard DOS criteria during 2016. The mine is therefore anticipated to accelerate intersection failure by approximately 2.5 years. The mine's impact on this intersection is therefore classified as significant based on standard industry practise (i.e. accelerates failure by one year or more). The payment of bring forward costs to offset development impacts is not applicable at this location as DMR has no planned upgrading works detailed in the *Roads Implementation Program*. Since intersection failure is expected to occur 2.5 years earlier as a result of the proposed development, and as no upgrading works are scheduled, the proponent is responsible for upgrading the intersection.

6.7.2 Assessment Criteria

The above intersection operation discussion assumes that DOS is the best measure of intersection performance. This assumption is consistent with DMR's guidelines. It is, however, noted that other authorities such as the NSW Roads and Traffic Authority (RTA) recommend the use of the critical movement average delay for assessing the performance of priority-controlled intersections. The RTA states that the critical movement average delay provides a better indication of intersection performance and safety for priority-controlled intersections. A summary of the delay thresholds recommended by the RTA is provided in Table 6.4. Although these thresholds are not documented within Queensland guidelines, they are considered a good performance measure.

Table 6.4 ***Industry Standard Level of Service (LOS) Criteria***

LOS	Average Delay per Vehicle (s/veh.)	Traffic Signals & Roundabout	Give Way & Stop Signals
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity: at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode

Source: *Guide to Traffic Generating Developments*, RTA, 2002

The delay thresholds reproduced in Table 6.4 support the earlier assertion that this intersection in its existing form will operate inadequately at 2023 irrespective of the proposed mine proceeding. It is reinforced that this poor expected performance is based on an assumed growth of 10% p.a. compound between 2008 and 2021 and 5% p.a. compound during 2022 and 2023. This growth projection results in a 3.8 fold increase in background vehicle volumes in addition to the increases specifically associated with the proposed Daunia Mine development and Goonyella Mine expansion projects.

6.7.3 Upgrade Layouts

Possible upgrading options to improve the traffic operation of this intersection include conversion to a seagull intersection, roundabout, signalisation or modification of approach priorities.

Conversion of this intersection to either a roundabout or signal-controlled form is considered inappropriate as these forms are inconsistent with driver expectations at this rural location and are therefore likely to pose a significant safety hazard. In addition, signal or roundabout control is generally only appropriate in 80km/h or less speed environments. Therefore, if these forms were implemented, the existing speed limit would need to be reduced which would result in additional delay for the through movements. Furthermore, conversion of the intersection to a roundabout could significantly increase queuing delays for the through movements. This is inappropriate given the regional travel function of the Peak Downs Highway. Conversion of the approach priorities is also inappropriate at this location given the function of the intersecting roads.

Therefore, given current driver expectations and the current speed environment, it is suggested that the only appropriate treatment at this location is conversion to a seagull intersection. It is noted that the potential for grade separation at this location has not been investigated.

The existing intersection has been reassessed for 2023 assuming conversion to a preferred DMR seagull form as detailed in Chapter 13 of the *Road Planning and Design Manual*.

Given current limitations of SIDRA, only the first 'stage' of the minor road right out movement was modelled using SIDRA. The second 'stage' left hand side merge was modelled using the merge analysis methodology documented in the *Highway Capacity Manual* prepared by the Transportation Research Board. Minor assumptions were made when applying this methodology to Queensland conditions. Importantly it is reinforced that the intersection has not been assessed as a two stage crossing as this is not representative of how the preferred DMR seagull intersection operates. The proposed seagull intersection form is shown on Figure 6.4 and the assessed first 'stage' form analysis results are summarised in Table 6.5.

Figure 6.4 ***Winchester Road/Peak Downs Highway Intersection Layout – Proposed Seagull Form***

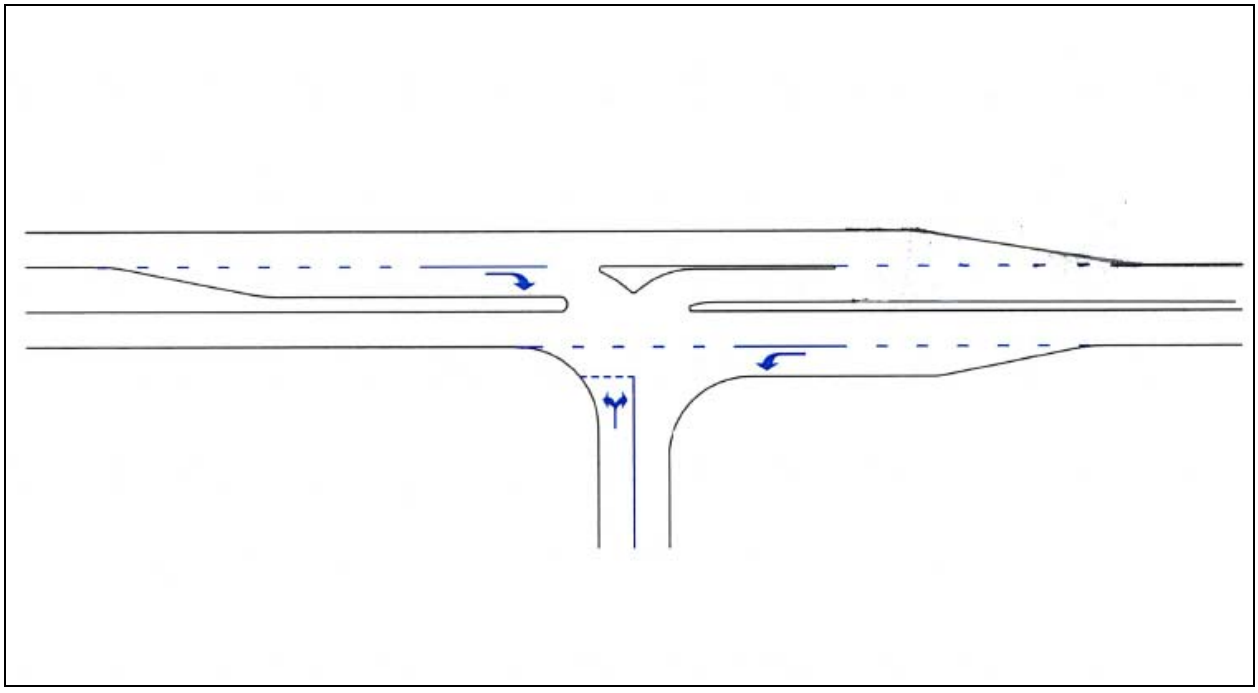


Table 6.5 ***Winchester Road/Peak Downs Highway Proposed Seagull Form (First 'Stage') - SIDRA Analysis Summary***

Scenarios	AM Peak			PM Peak		
	DOS	Critical Delay	95th %le Queue	DOS	Critical Delay	95th %le Queue
2023 Background	0.82	22	89	0.96	34	237
2023 With Development	0.94	36	146	1.08	104	463

The second 'stage' left to right merge is expected to operate with a Level of Service (LOS) of B or better for all assessed scenarios. For the purposes of the second 'stage' analysis, it was assumed that there would be a homogenous vehicle density for the hour long assessment period. While it is recognised that the actual density is likely to deviate from this assumption, the analysis results are not significantly influenced by the assumed density in the range of interest.

Based on the analysis results presented in Table 6.5 the proposed intersection form will operate outside DMR's standard DOS thresholds at 2023 irrespective of the proposed mine proceeding (i.e. at unacceptable levels of traffic delay).

6.7.4 Sensitivity Analysis

A sensitivity analysis has been undertaken to determine the influence the assumed background growth rate between 2008 and 2021 has on intersection performance. As stated previously, DMR officers have advised that 10% p.a. compound growth should be utilised when assessing future intersection operations. This growth rate, which results in a 3.5 fold increase in background traffic between 2008 and 2021, is considered quite high given the 13 year growth period and the specific allowances made for traffic generated by the proposed Goonyella Riverside Mine expansion and Daunia Mine development in addition to the background traffic growth. It is noted that for all assessed sensitivity scenarios the adopted growth rate between 2022 and 2043 is that previously reported in Section 4.3 (i.e. 5% p.a. compound). The results of the growth sensitivity analysis are presented in Table 6.6.

Table 6.6 Winchester Road/Peak Downs Highway
Proposed Seagull Form (First 'Stage') - Growth Sensitivity SIDRA Analysis Summary

Scenarios	AM Peak			PM Peak		
	DOS	Critical Delay	95th %le Queue	DOS	Critical Delay	95th %le Queue
2023 With Development (7% p.a.)	0.57	15	37	0.70	15	68
2023 With Development (8% p.a.)	0.66	17	50	0.81	19	101
2023 With Development (9% p.a.)	0.79	21	75	0.95	30	186
2023 With Development (10% p.a.)	0.94	36	146	1.08	104	463

The second 'stage' left to right merge is expected to operate with a Level of Service (LOS) of C or better for all assessed scenarios.

Further analysis indicates that, based on critical delay criteria, the proposed intersection form will operate at a LOS D or better should growth not exceed 9.5% p.a between 2008 and 2021 (3.6 fold increase between 2008 and 2023). However, analysis indicates that should background growth exceed 7.9% p.a. compound between 2008 and 2021 (3.0 fold increase between 2008 and 2023) in addition to the growth specifically associated with the proposed Daunia and Goonyella Riverside mine developments, the intersection will perform outside DMR's standard DOS thresholds.

It is also noted that the reported results are based on the assumption that Caval Ridge Mine's peak generation periods coincides with the network peak periods. As discussed earlier, this assumption provides DMR and IRC the assurance that the worst case has been assessed irrespective of actual shift times adopted. It is noted that, due to the assumption of coinciding with the peak period, the assessed network volumes are significantly higher than those observed particularly during the development's peak PM traffic generation period.

It is recommended that the existing intersection be upgraded to a seagull treatment to mitigate Caval Ridge Mine's traffic impacts. Although the performance of the recommended form does not meet DMR's standard DOS criteria at 2023 if background traffic volumes grow by greater than 7.9% between 2008 and 2021.

It is recommend that the development be conditioned to upgrade the Winchester Road/Peak Downs Highway intersection by 2016 to a preferred seagull intersection from consistent with design guidelines detailed in Chapter 13 of the *Road Planning and Design Manual*.

6.8 Moranbah Access Road/Peak Downs Highway

6.8.1 Existing Layout

The Moranbah Access Road/Peak Downs Highway intersection is currently a priority-controlled intersection constructed to an Austroads AUR/AUL standard on the Peak Downs Highway approaches and an Austroads BA standard on the Moranbah Access Road approach.

A significant proportion of the previous discussion in Section 6.7 is relevant to this section. To avoid unnecessary repetition reference is made where appropriate to earlier sections of this report.

The SIDRA intersection layout used for analysis is provided on Figure 6.5 and a summary of the analysis results for this form is detailed in Table 6.7. It is noted that Table 6.7 reports the DOS, critical delay and 95%ile queue for the critical movement for each reported performance measure.

Figure 6.5 ***Moranbah Access Road/Peak Downs Highway Intersection Layout – Existing Form***

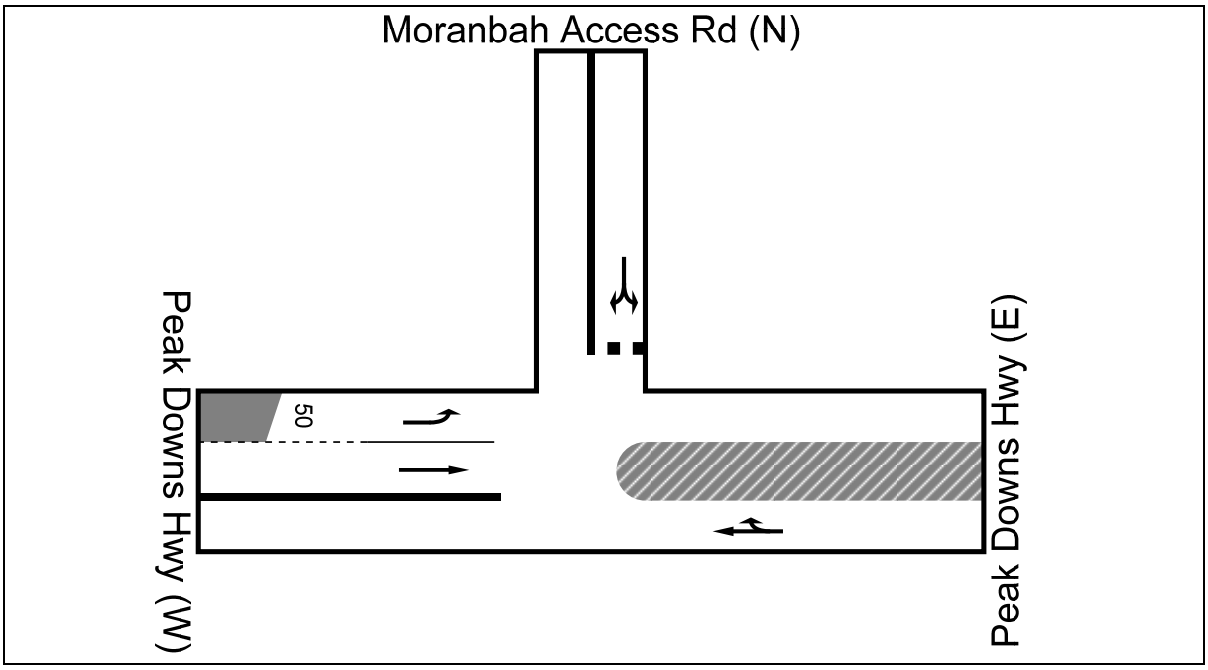


Table 6.7 ***Moranbah Access Road/Peak Downs Highway Existing Form - SIDRA Analysis Summary***

Scenarios	AM Peak			PM Peak		
	DOS	Critical Delay	95th %le Queue	DOS	Critical Delay	95th %le Queue
2012 Background	0.48	12	32	0.32	12	14
2012 With Development	0.70	15	80	0.38	14	19
2013 Background	0.64	14	60	0.47	14	27
2013 With Development	0.77	18	95	0.62	17	45
2023 Background	2.21	1,112	2,975	2.28	1,180	1,807
2023 With Development	2.51	1,388	3,476	2.81	1,651	2,295

The results detailed in Table 6.7 indicate that the intersection is anticipated to operate outside DMR's standard DOS performance criteria and outside industry standard critical delay criteria prior to 2023 irrespective of the Caval Ridge Mine proceeding. It is expected that the intersection will fail to meet DMR's standard DOS performance criteria in late 2014 during the AM weekday peak period under background traffic alone based on the assumed conservative (high) traffic growth rates.

It is estimated that, if the Caval Ridge Mine proceeds, this intersection will fail to meet DMR's standard DOS criteria in early 2013. The Caval Ridge Mine is therefore anticipated to accelerate intersection failure by approximately 1.5 years. The mine's impact on the intersection is therefore classified as significant based on standard industry practise (i.e. accelerates failure of intersection by one year or more). The payment of bring forward costs to offset development impacts is not applicable at this location as DMR has no planned upgrading works detailed in the *Roads Implementation Program*. Since intersection failure occurs 1.5 years earlier as a result of the Caval Ridge Mine and, as no upgrading works are scheduled, the proponent is responsible for upgrading this intersection.

6.8.2 Upgrade Layouts

Possible upgrading options to improve the traffic operation of this intersection include conversion to a seagull intersection, roundabout, signalisation or modification of approach priorities. However, for the reasons discussed in Section 6.7.3, only a seagull treatment is consider appropriate at this location. The existing intersection has therefore been reassessed for 2023 assuming conversion to a preferred DMR seagull form as defined in Chapter 13 of the *Road Planning and Design Manual*. The proposed seagull intersection layout is shown on Figure 6.6 and the assessed first 'stage' form analysis results are summarised in Table 6.8

Figure 6.6 ***Moranbah Access Road/Peak Downs Highway Intersection Layout – Proposed Seagull Form (First 'Stage')***

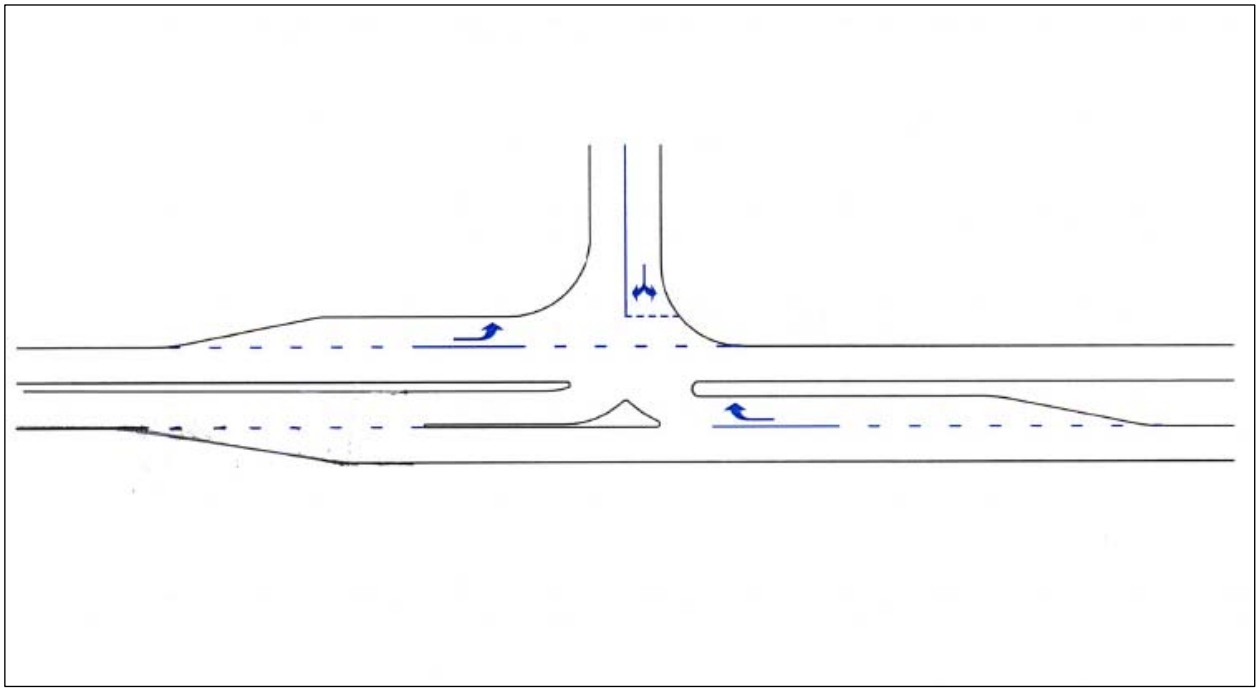


Table 6.8 ***Moranbah Access Road/Peak Downs Highway***
Proposed Seagull Form (First 'Stage') - SIDRA Analysis Summary

Scenarios	AM Peak			PM Peak		
	DOS	Critical Delay	95th %le Queue	DOS	Critical Delay	95th %le Queue
2023 Background	0.95	42	157	1.32	332.9	463
2023 With Development	1.13	149	445	1.69	659.6	869

The second 'stage' left to right merge is expected to operate with a Level of Service (LOS) of B or better for all assessed scenarios.

Based on the analysis results presented in Table 6.8, the proposed intersection form will operate outside DMR's standard DOS thresholds and industry standard critical delay criteria at 2023 irrespective of the Caval Ridge Mine proceeding.

6.8.3 Sensitivity Analysis

A sensitivity analysis has been undertaken to determine the influence the assumed background traffic growth rate between 2008 and 2021 has on intersection performance. DMR officers have advised that 10% p.a. compound growth should be utilised when assessing future intersection operations. As stated previously, this growth rate which results in a 3.5 fold increase in background traffic between 2008 and 2021 is considered quite high given the 13 year growth period and the specific allowances made for traffic generated by the proposed Goonyella Riverside Mine expansion and Daunia Mine development over and above background traffic growth. The results of the traffic growth sensitivity analysis are presented in Table 6.9.

Table 6.9 ***Moranbah Access Road/Peak Downs Highway***
Proposed Seagull Form (First 'Stage') - Growth Sensitivity SIDRA Analysis Summary

Scenarios	AM Peak			PM Peak		
	DOS	Critical Delay	95th %le Queue	DOS	Critical Delay	95th %le Queue
2023 With Development (7% p.a.)	0.69	18	59	0.81	30	63
2023 With Development (8% p.a.)	0.80	22	85	1.06	76	157
2023 With Development (9% p.a.)	0.95	39	162	1.28	293	473
2023 With Development (10% p.a.)	1.13	149	445	1.69	659.6	869

The second 'stage' left to right merge is expected to operate with a Level of Service (LOS) of B or better for all assessed scenarios.

Analysis indicates that, based on critical delay criteria, the proposed intersection form will operate at a LOS D or better should the background traffic growth be less than 7.7% p.a. compound between 2008 and 2021 (2.9 fold increase between 2008 and 2023). However, the results also indicate that should background growth exceed 6.9% p.a. compound between 2008 and 2021 (2.6 fold increase between 2008 and 2023) in addition to the growth specifically associated with the proposed Daunia and Goonyella Riverside mine developments, the intersection will perform outside DMR's standard DOS thresholds.

It is also noted that the reported results are based on the assumption that the development's peak generation periods coincides with the network peak periods. As discussed earlier, this assumption provides DMR and IRC the assurance that the worst case has been assessed irrespective of actual shift times adopted. It is noted that due to the assumption of coinciding peak periods, the assessed network volumes are significantly higher than those observed particularly during the development's peak PM traffic generation period.

It is recommended that the existing intersection be upgraded to a seagull from to mitigate development impacts although the performance of this intersection form does not meet DMR's standard DOS criteria at 2023 if background traffic volumes grow by greater than 6.9% p.a. between 2008 and 2021.

It is recommended that the development be conditioned to upgrade the Peak Downs Highway/Moranbah Access Road intersection by early 2013 to a seagull form consistent with design guidelines detailed in Chapter 13 of the *Road Planning and Design Manual*.

6.9 Road Link Impacts

6.9.1 Road Capacity

DMR's *Guidelines for the Assessment of Road Impacts of Development* states that traffic operation impacts need to be considered for all State-controlled road sections where the construction or operational traffic generated by a proposed development equals or exceeds 5% of the existing AADT. For the purposes of this report, DMR's scoping methodology has also been used to determine the assessment scope for Council assets consistent with advice provided by Isaac Regional Council officers.

In accordance with DMR's scoping guidelines, the Caval Ridge Mine's traffic impacts on the following study sections has been considered:

- Link A - Peak Downs Highway between the Mine Site Access and Winchester Road;
- Link B - Peak Downs Highway between Winchester Road and Moranbah Access Road;
- Link C - Moranbah Access Road between Peak Downs Highway and Railway Road.

Definition of the road link assessment scope has been based on existing/inferred (2007) AADT/ADT volumes consistent with the DMR guidelines.

Traffic conditions have been assessed for the year 2012, which is the anticipated last year of construction, 2013 the year mining operations commence and 2023 which represents the 10 year traffic design horizon post commencement of mining operations.

For all assessment years, analysis has been completed for both the with and without Caval Ridge Mine traffic scenarios. This is for the purposes of determining the marginal impact of the mine on the surrounding road network.

The traffic operation of each study section has been assessed using the methodology detailed in the Austroads *Guide to Traffic Engineering Practice Part 2 – Roadway Capacity.* In the *Guidelines for Assessment of Road Impacts of Development*, DMR states that for rural State-controlled roads generally remedial measures are sought to maintain existing LOS. It is stated that LOS C is the minimum standard DMR would except on rural roads not affected by recreational weekend peak periods.

Table 6.10 documents the road link analysis.

Table 6.10 ***Forecast Link Volumes and LOS Assessment***

Link	Survey K factor	Assumed K factor	Existing (2007)		2012				2013				2023			
					Background		With Development		Background		With Development		Background		With Development	
			AADT	LOS	AADT	LOS	AADT	LOS	AADT	LOS	AADT	LOS	AADT	LOS	AADT	LOS
A	6.6%	10.0%	512	A	845	A	1,277	A	1,067	A	1,424	A	2,290	A	2,647	B
B	16.6%	15.0%	1,876	B	3,133	B	3,503	C	3,561	C	3,864	C	8,044	D	8,346	D
C	11.8%	12.0%	3,821	B	6,326	C	6,683	D	7,126	D	7,423	D	16,376	E	16,673	E

Link A - Peak Downs Highway between the Mine Site Access and Winchester Road
Link B - Peak Downs Highway between Winchester Road and Moranbah Access Road
Link C - Moranbah Access Road between Peak Downs Highway and Railway Road

The results presented in Table 6.10 indicate that Link A is expected to operate within DMR's standard LOS thresholds at 2023 irrespective of Caval Ridge Mine proceeding. Therefore no mid-block capacity improvements are required.

Link B is expected to operate within DMR's standard LOS thresholds at 2012 and 2013 irrespective of the Caval Ridge Mine. At 2023, it is anticipated that Link B will not meet DMR's standard performance criteria (i.e. LOS C or better) irrespective of the mine proceeding.

Link C is expected to operate within DMR's standard LOS thresholds up until and during part of 2012 should the mine not proceed. Should the mine proceed, Link C is anticipated operate outside DMR's standard LOS thresholds prior to 2012.

Further analysis indicates that the Caval Ridge Mine results in the LOS thresholds for Link B and Link C being reached less than one year earlier than without the mine traffic. The mine's impact is therefore classified as insignificant and therefore developer contributions to the upgrading of links B and C for additional traffic capacity are not warranted based on a broad AADT assessment.

6.9.2 Road Alignment

The Caval Ridge mining lease is bisected by Peak Downs Highway. To ensure the site can operate as a single integrated site with no requirement for mining vehicles to interact with the highway, grade separation of the internal mine haul routes and the highway is required. It is proposed to undertake a vertical realignment of the highway, retaining the existing horizontal road corridor. This vertical realignment is required entirely by the mine and will therefore be the responsibility of the proponent to fund.

7.0 PAVEMENT IMPACT ASSESSMENT

7.1 Assessment Methodology

Analysis has been conducted to identify the pavement impacts on the State-controlled road network due to additional heavy vehicle movements generated during the Caval Ridge Mine's construction and operations phases. This pavement impact assessment has been undertaken in accordance with DMR's *Guidelines for the Assessment of Road Impacts of Development* and in accordance with the methodology outlined in the *Notes for Contribution Calculations* prepared by the former DMR Central District.

DMR's *Notes for Contribution Calculation* guideline states that pavement impacts need to be considered for any road section where the construction or operational traffic exceeds 5% of the background equivalent standard axles (ESAs) year for year. That scoping methodology has been utilised in this assessment. It is noted that this methodology varies from that detailed in DMR's *Guidelines for the Assessment of Road Impacts of Development.*

Due to the complexity of determining the percentage impact for each year and each phase of the development, the scoping test was conducted after the road network analysis was completed. That is, analysis was initially completed for a broader spatial scope than required and therefore analysis results for a broader area than required are presented herein.

Consistent with DMR guidelines, the pavement impact assessment has been undertaken for the 32 year project life between 2011 and 2043. The assessment period includes the anticipated 2 year mine construction phase and the 30 year mining operations phase.

For the purposes of the pavement impact assessment, the road network was divided into directional sections such that the seal width, roughness, existing AADT traffic volumes and development traffic loadings were generally homogenous for each assessed section. The pavement impact assessment documented in this report utilises roughness as the sole measure of pavement distress.

This pavement impact assessment relies on:

- volume of heavy vehicle traffic on road links, both generated by the mine and also as a background level;
- background level heavy vehicle traffic includes existing traffic, additional traffic due to background growth and additional traffic associated with the proposed Daunia Mine development and Goonyella Riverside expansion projects;
- existing roughness of pavement and ultimate capacity/life of pavement with the application of a roughness deterioration rate;

- cost to upgrade/rehabilitate/maintain the pavement (per km adopted);
- percentage bring forward of any need to rehabilitate pavement sections;
- maintenance contribution requirements.

7.2 Traffic Growth

During prelodgement discussions, DMR officers advised that the following compound growth rates should be assumed when projecting future background volumes:

- mine access to Eton 10% p.a. compound;
- Eton to Alexandria 5% p.a. compound.

Those traffic growth rates exclude the specific allowances made for traffic generated by the proposed Daunia Mine and Goonyella Riverside Mine expansion projects.

Consistent with advice provided by DMR officers, it is not anticipated that the stipulated growth rates could be sustained over a prolonged period. It is instead considered inappropriate to utilise these rates over the full 32 year assessment period. It has therefore been assumed that this high traffic growth would occur between 2007 and 2021 after which time growth would reduce. The growth rates used for the purposes of this assessment are detailed in Table 7.1 by period. The use of lower traffic growth rates for the assessment is conservative as it reduces projected background volumes which in turn increases the proposed development's proportional pavement impact and the likelihood of developer maintenance contributions.

Table 7.1 ***Assumed Growth Rates***

Road Section	2007-2021	2022-2041
Mine access to Eton	10% p.a. (compound)	5% p.a. (compound)
Eton to Alexandria	5% p.a. (compound)	3% p.a. (compound)

7.3 Pavement Assumptions

During prelodgement discussions, DMR officers advised that the following values should be used when undertaking the pavement impact assessment:

- 2007 AADT traffic count data supplied by DMR;
- classified vehicle ESA as per DMR direction;
- 3.2 ESA/HV on Peak Downs Highway for existing traffic;
- 3 counts/km annual roughness increase for Peak Downs Highway;
- 120 counts/km terminal roughness criteria for Peak Downs Highway;
- nominal treasury discount rate of 6%.

In addition, DMR officers advised that the maintenance costs detailed in Table 7.2 should be assumed for the pavement impact assessment.

Table 7.2 ***Assumed Routine Maintenance Costs (2007 Cost Base)***

Seal Width (m)	Annual Routine Maintenance ($/km)
3.6	$4,700
5	$6,000
6	$9,800
7	$9,100
8	$10,300
9	$11,000
10	$12,200
11	$12,900
12	$14,100

DMR officers also advised that the current rehabilitation cost per kilometre is typically $700,000 in the Mackay/Whitsunday region. It has been assumed that this typical cost was for a 9m wide pavement. The prorated rehabilitation costs by pavement width as detailed in Table 7.3 were therefore assumed.

Table 7.3 ***Assumed Rehabilitation Costs (2008 Cost Base)***

Seal Width (m)	Rehabilitation Costs ($/km)
3.6	$280,000
5	$388,889
6	$466,667
7	$544,444
8	$622,222
9	$700,000
10	$777,778
11	$855,556
12	$933,333

Importantly, it should be noted that the advised rehabilitation cost is double that recently recommended for the adjacent Fitzroy region. Further investigation of rehabilitation costs per kilometre in the Mackay/Whitsunday region is potentially warranted given the significant variation between adjacent regions.

For the purposes of the pavement assessment, a 7% inflation rate has been assumed. It is noted that the treasury discount rate stipulated by Mackay/Whitsunday Region officers is less than that recently recommended for projects in the adjacent Fitzroy region. Given the significant impact the assumed discount rate has on the present value of the maintenance cost stream, it is recommended that the validity of the advised discount rate be confirmed during any developer contribution discussions.

When assessing pavement impacts, no account has been made for the upgrading works detailed in DMR's RIP as summarised in Section 3.4 of this report. These works generally comprise isolated rehabilitation and pavement widening works.

7.4 Heavy Vehicle Forecasts

The heavy vehicle traffic generation of the Caval Ridge Mine has been forecast by vehicle class for both the construction and operations phases based on data supplied by BMA for the period 2011 to 2043. The number and type of vehicles generated for both phases of the mine development are summarised in Table 5.3. It has been assumed that all delivery vehicles would travel to/from the site loaded/unloaded and all waste vehicles would travel to/from the site unloaded/loaded.

The heavy vehicle traffic generation of the proposed Daunia Mine and Goonyella Mine expansion projects, which has been reported as part of the background traffic volumes, was based on preliminary data supplied by BMA.

Based upon these values, an estimate of existing annual ESA loading along the haulage route. The classification of heavy vehicles generated by the Caval Ridge Mine was then used to determine the additional annual ESA loadings produced along the haulage routes as a result of the traffic generated by the Caval Ridge Mine. ESA loadings are summarised on Figure B.1 at Appendix B.

7.5 Pavement Rehabilitation Impacts

Table 7.4 shows a summary of the reduction in estimated service life on the Peak Downs Highway as a result of the proposed development. Further detail is provided on Figure B.2 at Appendix B.

Table 7.4 Reduction in Estimated Service Life – Peak Downs Highway

Road	Section	Direction	Rehabilitation Year		Reduction in Estimated Service Life (Years)
			Without Development	With Development	
Peak Downs Highway (33A)	(1/2) - Inter. Gregory Development Road to Caval Ridge Mine Access	Eastbound (G)	2017.7	2017.7	0.0
		Westbound (A)	2017.7	2017.7	0.0
	(3/4) - Caval Ridge Mine Access to Inter. Dysart Road	Eastbound (G)	2026.1	2025.5	0.6
		Westbound (A)	2026.1	2025.4	0.7
	(5/6) - Inter. Dysart Road to Inter. Moranbah Access Road	Eastbound (G)	2029.8	2029.5	0.3
		Westbound (A)	2029.8	2029.5	0.3
	(7/8) - Inter. Moranbah Access Road to Old Belyando/Nebo Shire Boundary	Eastbound (G)	2027.3	2027.3	0.0
		Westbound (A)	2027.3	2027.2	0.1
	(9/10) - Old Belyando/Nebo Shire Boundary to No Marker	Eastbound (G)	2027.3	2027.3	0.0
		Westbound (A)	2027.3	2027.2	0.1
	(11/12) - No Marker to Daunia Turnout	Eastbound (G)	2023.3	2023.3	0.0
		Westbound (A)	2023.3	2023.3	0.0
Peak Downs Highway (33A)	(13/14) - Daunia Turnout to Thirty Mile Creek	Eastbound (G)	2024.0	2024.0	0.0
		Westbound (A)	2024.0	2023.9	0.1
	(15/16) - Thirty Mile Creek to Inter. Fitzory Development Road	Eastbound (G)	2032.2	2032.2	0.0
		Westbound (A)	2032.2	2032.1	0.1
	(17/18) - Inter. Fitzory Development Road to Inter. Oxford Downs - Sarina Road	Eastbound (G)	2026.9	2026.9	0.0
		Westbound (A)	2026.9	2026.8	0.1
Peak Downs Highway (33B)	(19/20) - Inter. Oxford Downs - Sarina Rd to Inter. Reynolds Street & Cemetery Access Road	Eastbound (G)	2028.6	2028.6	0.0
		Westbound (A)	2028.6	2028.5	0.1
	(21/22) - Inter. Reynolds Street & Cemetery Access Road to Denison Creek Bridge	Eastbound (G)	2025.8	2025.8	0.0
		Westbound (A)	2025.8	2025.8	0.0
	(23/24) - Denison Creek Bridge to Inter. Eton - Homebush Road	Eastbound (G)	2028.0	2028.0	0.0
		Westbound (A)	2028.0	2027.9	0.1
	(25/26) - Inter. Eton - Homebush Road to Camerons Road	Eastbound (G)	2028.1	2028.1	0.0
		Westbound (A)	2028.1	2028.0	0.1
	(27/28) - Camerons Road to Inter. Mackay - Eungella Road	Eastbound (G)	2026.9	2026.9	0.0
		Westbound (A)	2026.9	2026.8	0.1

Table 7.1 shows that, for all road segments considered, the increased heavy vehicle loading due to the Caval Ridge Mine is negligible (less than 1%) and will not significantly impact the timing of pavement rehabilitation works (i.e. it will not accelerate works by one year or more). No developer contributions to pavement rehabilitation are therefore warranted.

7.6 Pavement Maintenance Impacts

The proponent's obligation towards routine maintenance of the Peak Downs Highway has been calculated based on the percentage increase in ESA's on each road segment from 2011 to 2043 as a result of the mine development. This is reported as a percentage for each road section and each year of the development until 2043. Further detail is provided on Figure B.3 at Appendix B. A summary of the average impact percentages is reported in Table 7.5.

Table 7.5 ***Average Development Impact - Maintenance***

Road	Section	Direction	Average Impact (2011 - 2043)
Peak Downs Highway (33A)	(1/2) - Inter. Gregory Development Road to Caval Ridge Mine Access	Eastbound (G)	0.0%
		Westbound (A)	0.0%
	(3/4) - Caval Ridge Mine Access to Inter. Dysart Road	Eastbound (G)	5.4%
		Westbound (A)	5.9%
	(5/6) - Inter. Dysart Road to Inter. Moranbah Access Road	Eastbound (G)	1.9%
		Westbound (A)	2.7%
	(7/8) - Inter. Moranbah Access Road to Old Belyando/Nebo Shire Boundary	Eastbound (G)	0.2%
		Westbound (A)	0.7%
	(9/10) - Old Belyando/Nebo Shire Boundary to No Marker	Eastbound (G)	0.1%
		Westbound (A)	0.4%
	(11/12) - No Marker to Daunia Turnout	Eastbound (G)	0.1%
		Westbound (A)	0.4%
	(13/14) - Daunia Turnout to Thirty Mile Creek	Eastbound (G)	0.2%
		Westbound (A)	0.5%
	(15/16) - Thirty Mile Creek to Inter. Fitzory Development Road	Eastbound (G)	0.2%
		Westbound (A)	0.5%
	(17/18) - Inter. Fitzory Development Road to Inter. Oxford Downs - Sarina Road	Eastbound (G)	0.1%
		Westbound (A)	0.4%
Peak Downs Highway (33B)	(19/20) - Inter. Oxford Downs - Sarina Road to Inter. Reynolds Street & Cemetery Access Road	Eastbound (G)	0.1%
		Westbound (A)	0.4%
	(21/22) - Inter. Reynolds Street & Cemetery Access Road to Denison Creek Bridge	Eastbound (G)	0.1%
		Westbound (A)	0.3%
	(23/24) - Denison Creek Bridge to Inter. Eton – Homebush Road	Eastbound (G)	0.1%
		Westbound (A)	0.5%
	(25/26) - Inter. Eton - Homebush Road to Camerons Road	Eastbound (G)	0.1%
		Westbound (A)	0.5%
	(27/28) - Camerons Road to Inter. Mackay - Eungella Road	Eastbound (G)	0.1%
		Westbound (A)	0.4%

Table 7.5 shows that the Caval Ridge Mine impacts on pavement maintenance exceed the 5% threshold for some road sections therefore maintenance contributions are required. For guidance, the maintenance assessment summary at Appendix B shows that the mine would be responsible for a contribution of approximately $49,930 (2009 cost base) for pavement maintenance activities through to 2043.

8.0 CONCLUSIONS

The proposed Caval Ridge Mine will use rail to transport its primary product (i.e. coal). However, the transport of staff, material deliveries and waste exports will be undertaken by road, thereby necessitating this traffic impact assessment.

8.1 Traffic Generation

The Caval Ridge Mine project has been divided into two distinctive phases for the purposes of this traffic assessment due to the different traffic demands of each phase. The construction phase will generate the highest rates of traffic with an average workforce of 843 and an average amount of deliveries of 12 trucks per day over two years. Within this two years is expected a peak six month period with a 1,400-strong workforce and deliveries by 53 trucks per day. The mining operations phase will extend over 30 years with an average workforce of 493 staff and average deliveries by seven trucks per day. Staff will be predominantly bussed to site from the vicinity of Moranbah while goods and waste trucks are expected to primarily arrive from both Moranbah and Mackay.

8.2 Background Traffic

The adjacent road network, comprising primarily Peak Downs Highway and Moranbah Access Road, is expected to experience significant traffic growth due to other industrial activities planned for the vicinity. In addition to that growth, other BMA Bowen Basin Growth Project components are expected to commence activities. These include the Daunia Mine development and the Goonyella Riverside Mine expansion. These growth projects have been considered in addition to the expected high background traffic growth. Given the extent of the expected traffic growth (in the order of 5 – 10% p.a. compound), it is unlikely that this will be sustained for more than about ten years. Moderate growth rates have therefore been assumed beyond 2021.

8.3 Traffic Impacts & Required Upgrades

The traffic impacts of Caval Ridge Mine on the adjacent road network are defined in accordance with the DMR *Guidelines for the Assessment of Road Impacts of Developments* as where the mine traffic will exceed 5% of the expected background traffic volumes. The impacted road elements have then be assessed for a horizon 10 years after mining operations commence.

Recommended road works to mitigate the traffic impacts of the Caval Ridge Mine are:

- formation of a priority-controlled construction access on Peak Downs Highway to include a protected right and left turn lane on the highway;
- formation of a priority-controlled mining operations access on Peak Downs Highway to include protected right and left turn lane on the highway;
- upgrade of the Peak Downs Highway/Winchester Road intersection to a seagull intersection in accordance with Chapter 13 of DMR's *Road Planning and Design Manual*;
- upgrade of the Peak Downs Highway/Moranbah Access Road intersection to a seagull intersection in accordance with Chapter 13 of DMR's *Road Planning and Design Manual*.

It should be noted that the assumed very high background traffic growths have a significant influence on the required works. Furthermore, it is believed DMR are currently in negotiations with another party regarding upgrading the Peak Downs Highway/Moranbah Access Road intersection. The details of these works, when available, should be considered when designing and costing any further upgrades.

8.4 Pavement Impacts & Required Upgrades

The pavement impacts of Caval Ridge Mine on the adjacent road network are defined in accordance with the DMR *Guidelines for the Assessment of Road Impacts of Developments* and the *Notes for Contribution Calculations* as where the mine traffic loading (measured in ESA) will exceed 5% of the expected background traffic loading. The impacted road elements have then been assessed for the life of the project.

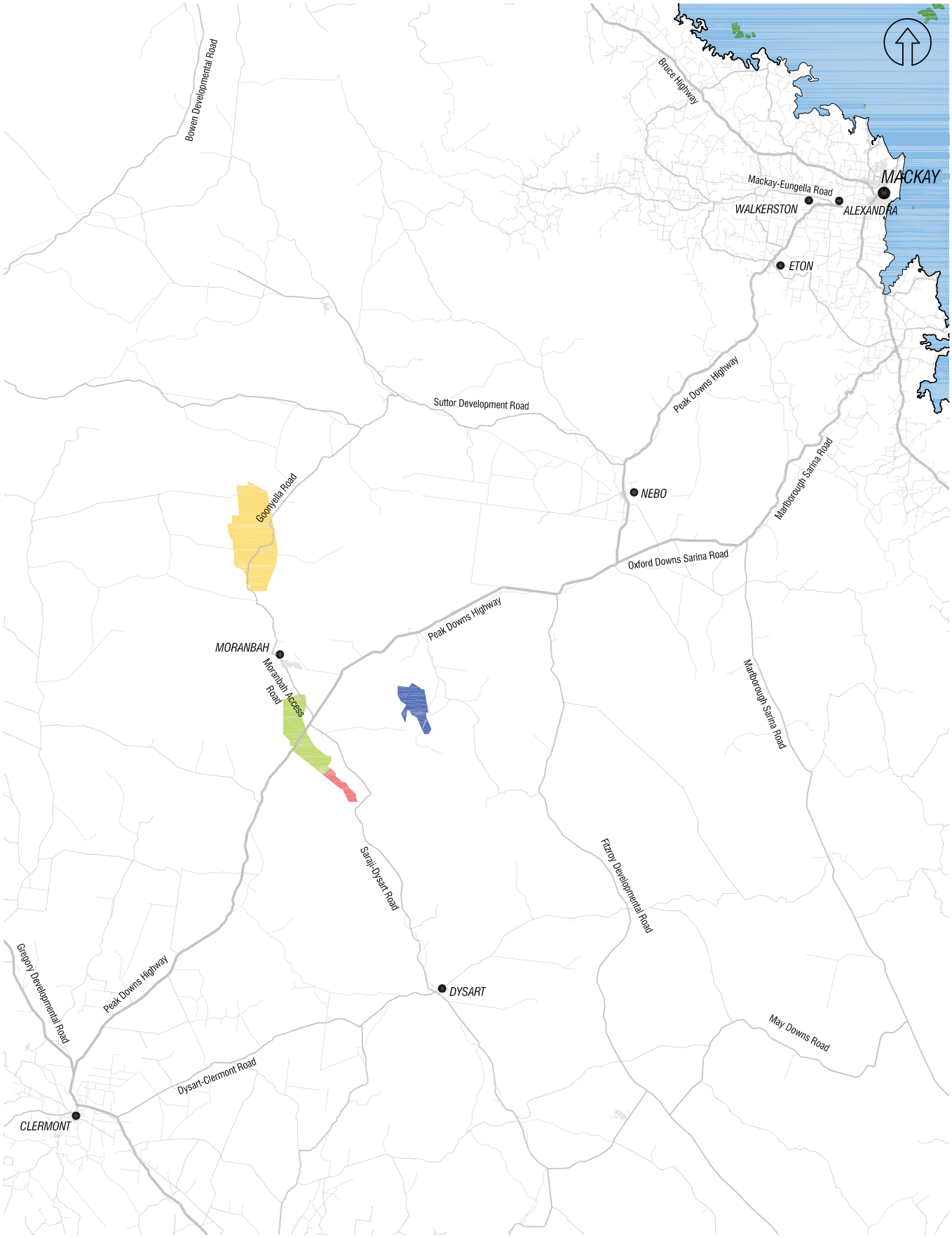
The pavement impacts of Caval Ridge Mine do not necessitate any additional pavement rehabilitation works but the project will impact upon the pavement maintenance requirements for Peak Downs Highway. Based on the annual routine maintenance costs provided by DMR and the extent of the pavement impacts calculated, a maintenance contribution of $49,930 (2009 base) is required to account for the traffic impacts of Caval Ridge Mine.

8.5 Infrastructure Contribution Agreement

Due to the number of factors that influence the size of the contribution and road works required by Caval Ridge Mine as a result of pavement maintenance and intersection upgrades, it is recommended that an infrastructure agreement with DMR be entered into. The influencing factors include expected very high background traffic growth and works being undertaken by others in the vicinity of the mine. The need for a vertical realignment of Peak Downs Highway as it passes the Caval Ridge Mine site may create opportunities for economies of scale for programming road works.

Appendix A

Report Figures



LEGEND

- Proposed Caval Ridge Mining Lease
- Proposed Daunia Mining Lease
- Proposed Goonyella Mining Lease
- Proposed Peak Downs Mining Lease

Caval Ridge EIS Traffic Study
Site Location Plan

Figure No: A1 | Project No: CE005850 | Date: 17/11/2008

A1 ardno Eppell Olsen

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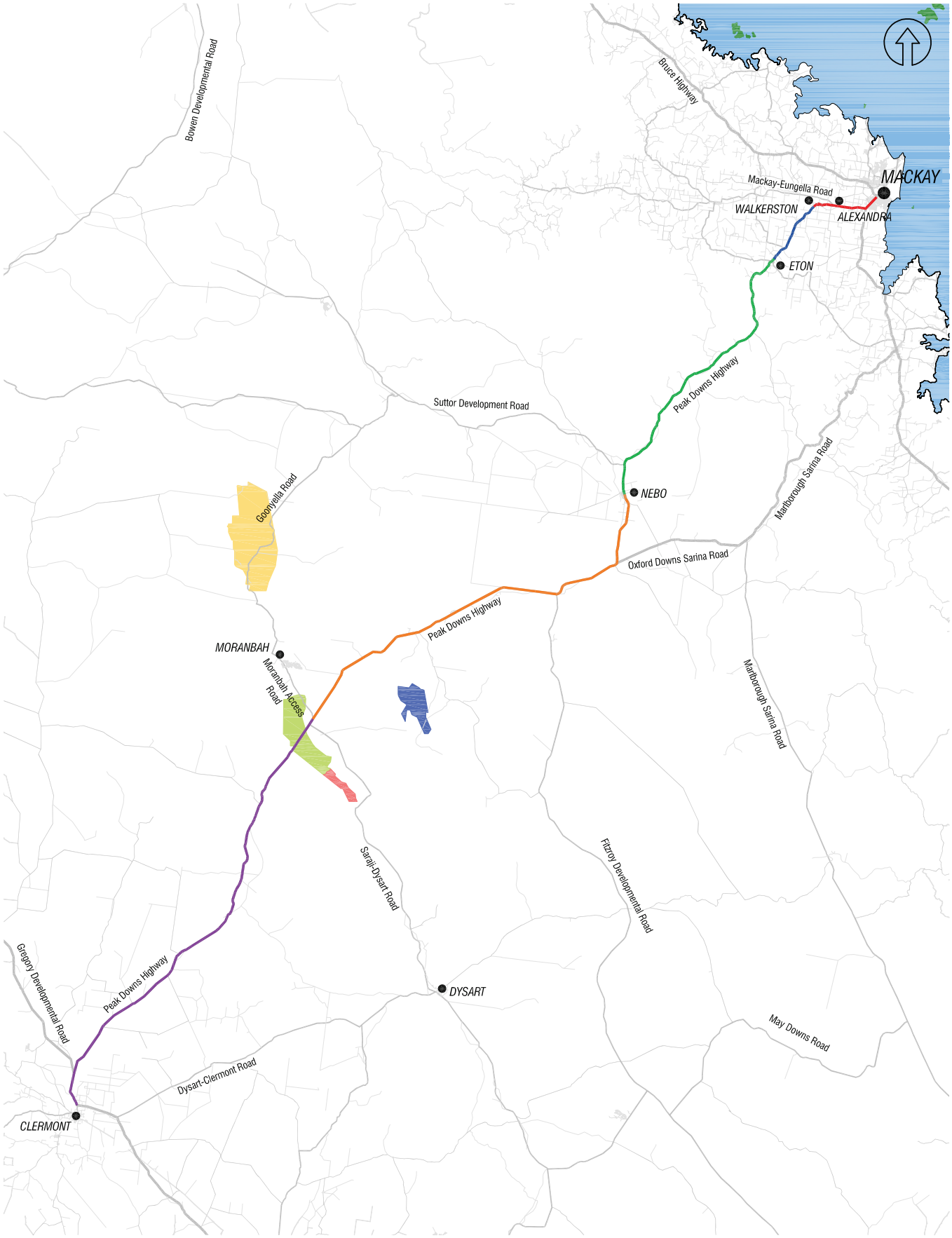

LEGEND

- Proposed Caval Ridge Mining Lease
- Proposed Daunia Mining Lease
- Proposed Goonyella Mining Lease
- Proposed Peak Downs Mining Lease

- Section 1 - Mackay to Walkerston
- Section 2 - Walkerston to Eton
- Section 3 - Eton to Nebo
- Section 4 - Nebo to Moranbah
- Section 5 - Moranbah - Clermont

Caval Ridge EIS Traffic Study
Road Sections

Figure No: A2 | Project No: CE005850 | Date: 17/11/2008

A2 Hardno Eppell Olsen

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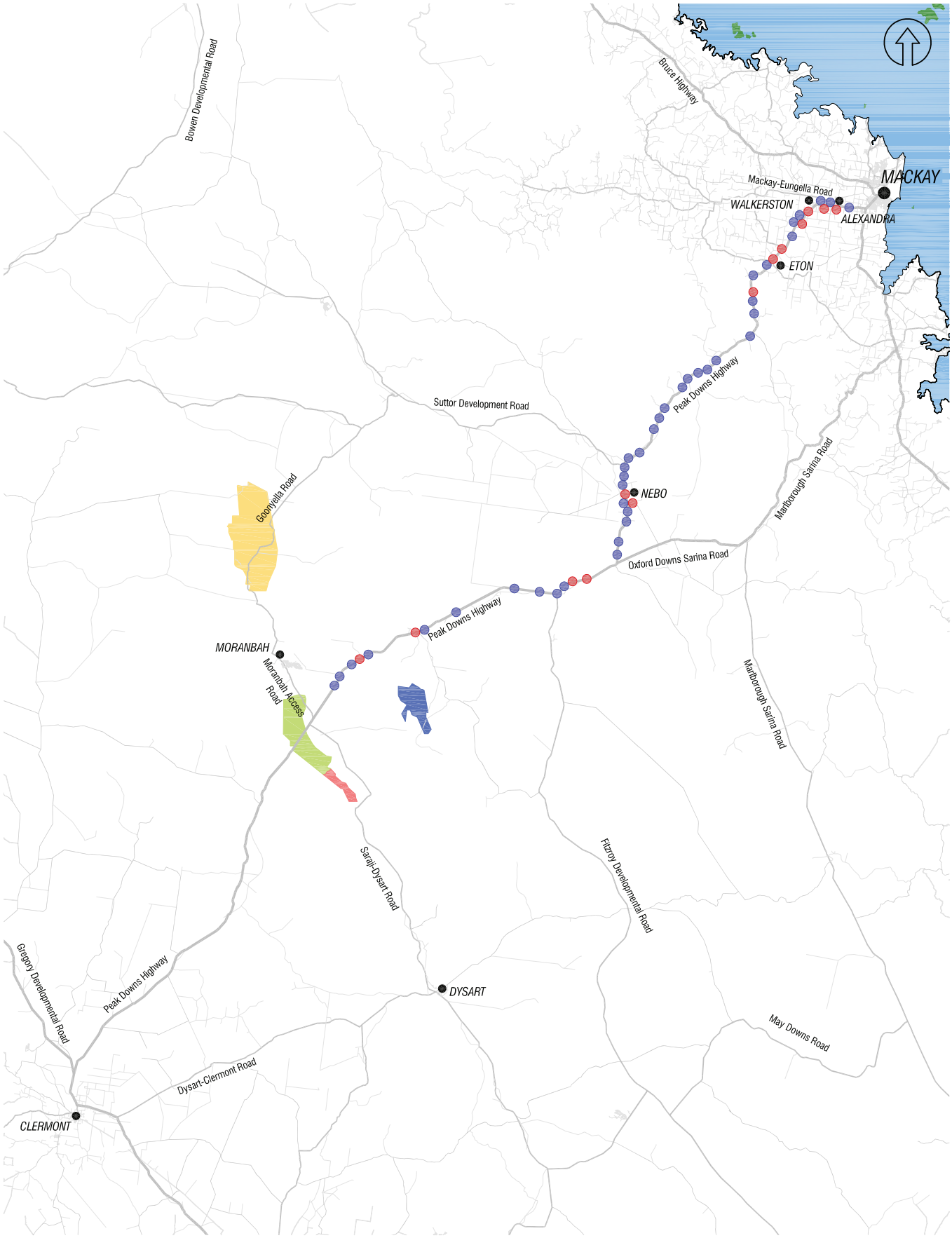

LEGEND

- Proposed Caval Ridge Mining Lease
- Proposed Daunia Mining Lease
- Proposed Goonyella Mining Lease
- Proposed Peak Downs Mining Lease
- Single Vehicle Crash Location
- Multiple Vehicle Crash Location

Caval Ridge EIS Traffic Study

Peak Downs Highway Crash Locations

Figure No: A3 | Project No: CE005850 | Date: 17/11/2008

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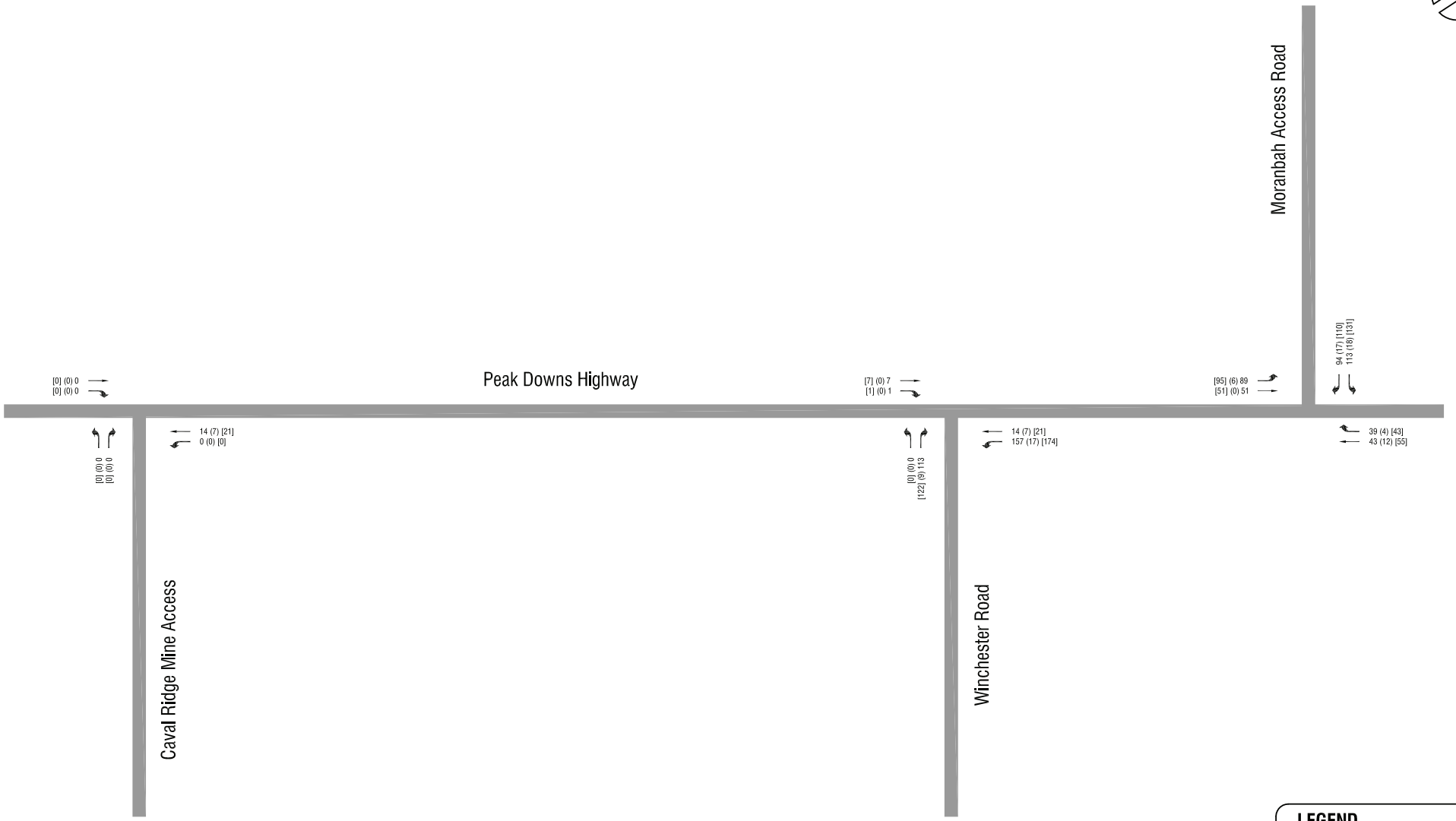

LEGEND

0000	Light Vehicles
(0000)	Commercial Vehicles
[0000]	Total Vehicles

A4

Caval Ridge EIS Traffic Study
2008 Background Volumes
AM

Figure No: A4 | Project No: CE005850 | Date: 02/10/2008

Cardno Eppell Olsen

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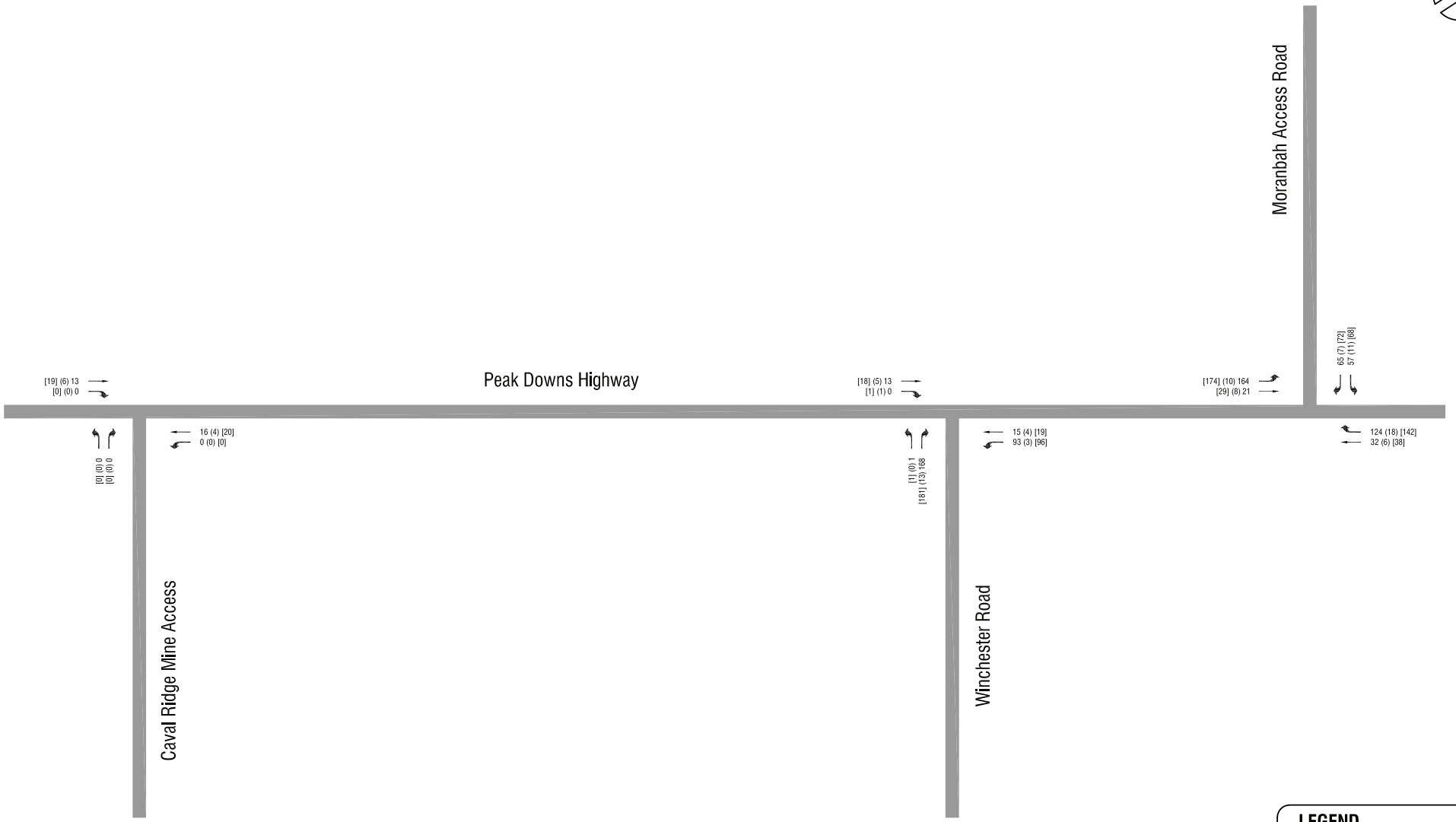

A5

Caval Ridge EIS Traffic Study
2008 Background Volumes
PM

Figure No: A5 | Project No: CE005850 | Date: 02/10/2008

Cardno Eppell Olsen

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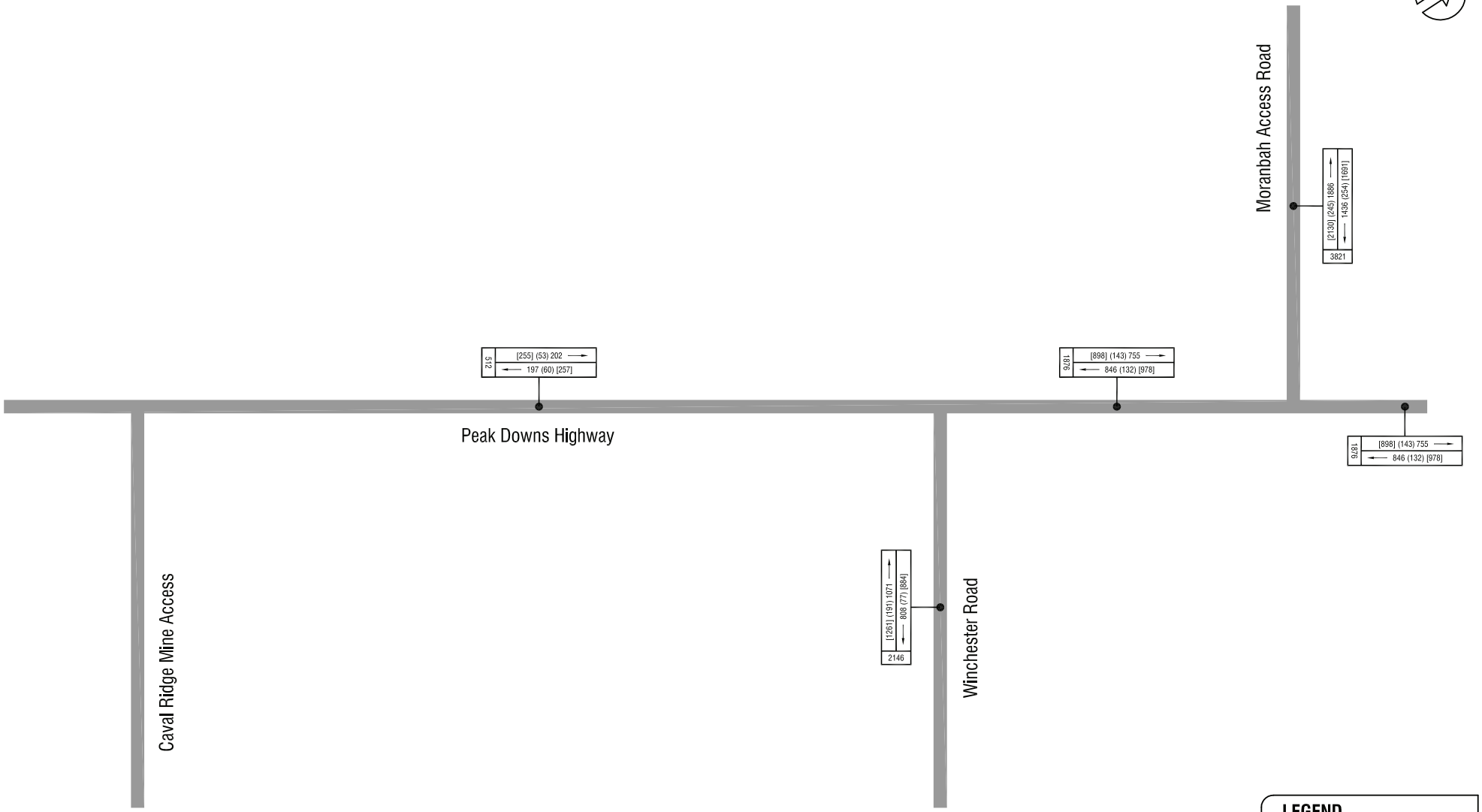

A6

Caval Ridge EIS Traffic Study
2007 Background Volumes
Daily

Figure No: A6 | Project No: CE005850 | Date: 02/10/2008

Cardno Eppell Olsen

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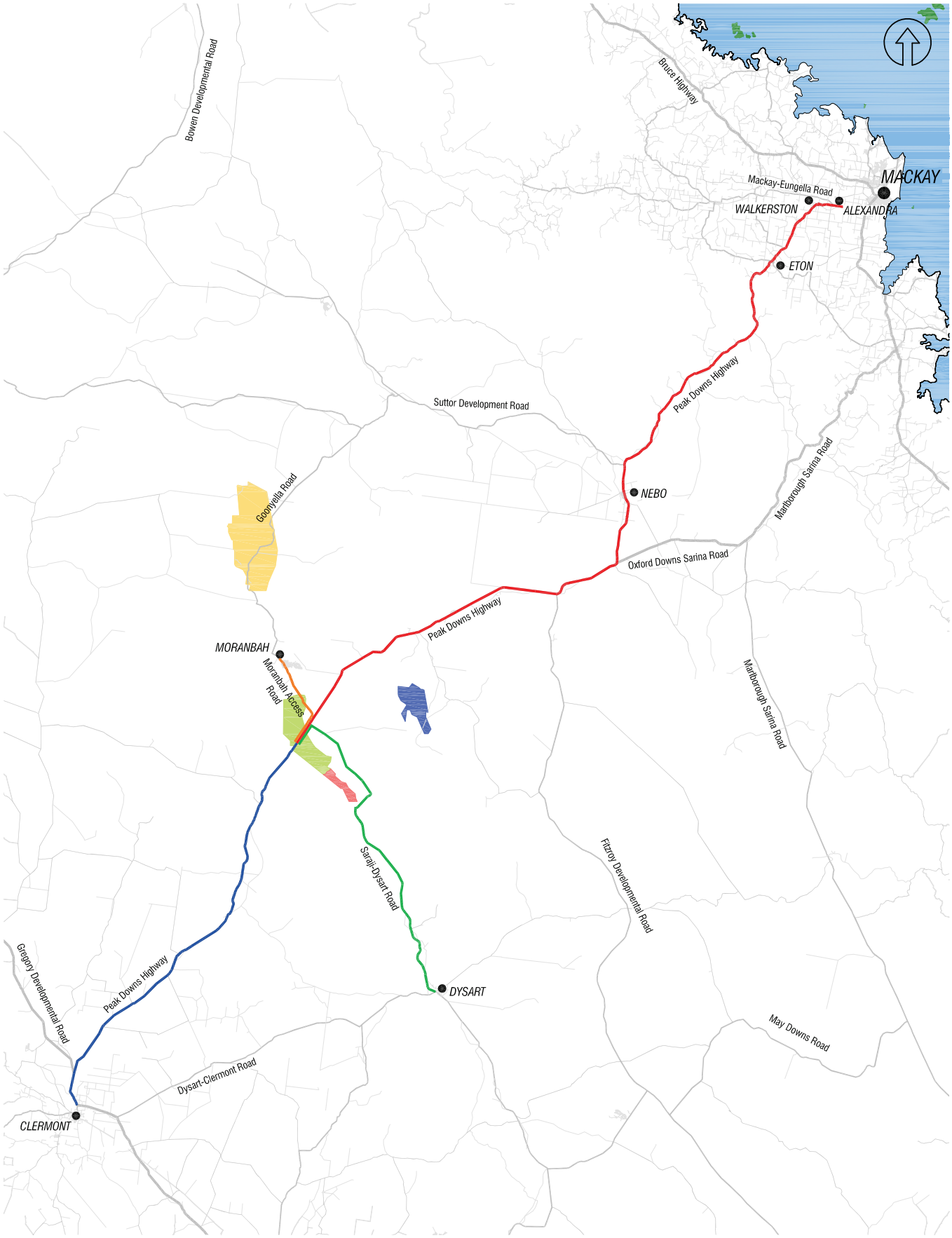

Caval Ridge EIS Traffic Study
Route Origins And Destinations

Figure No: A7 | Project No: CE005850 | Date: 17/11/2008

A7 ardno Eppell Olsen

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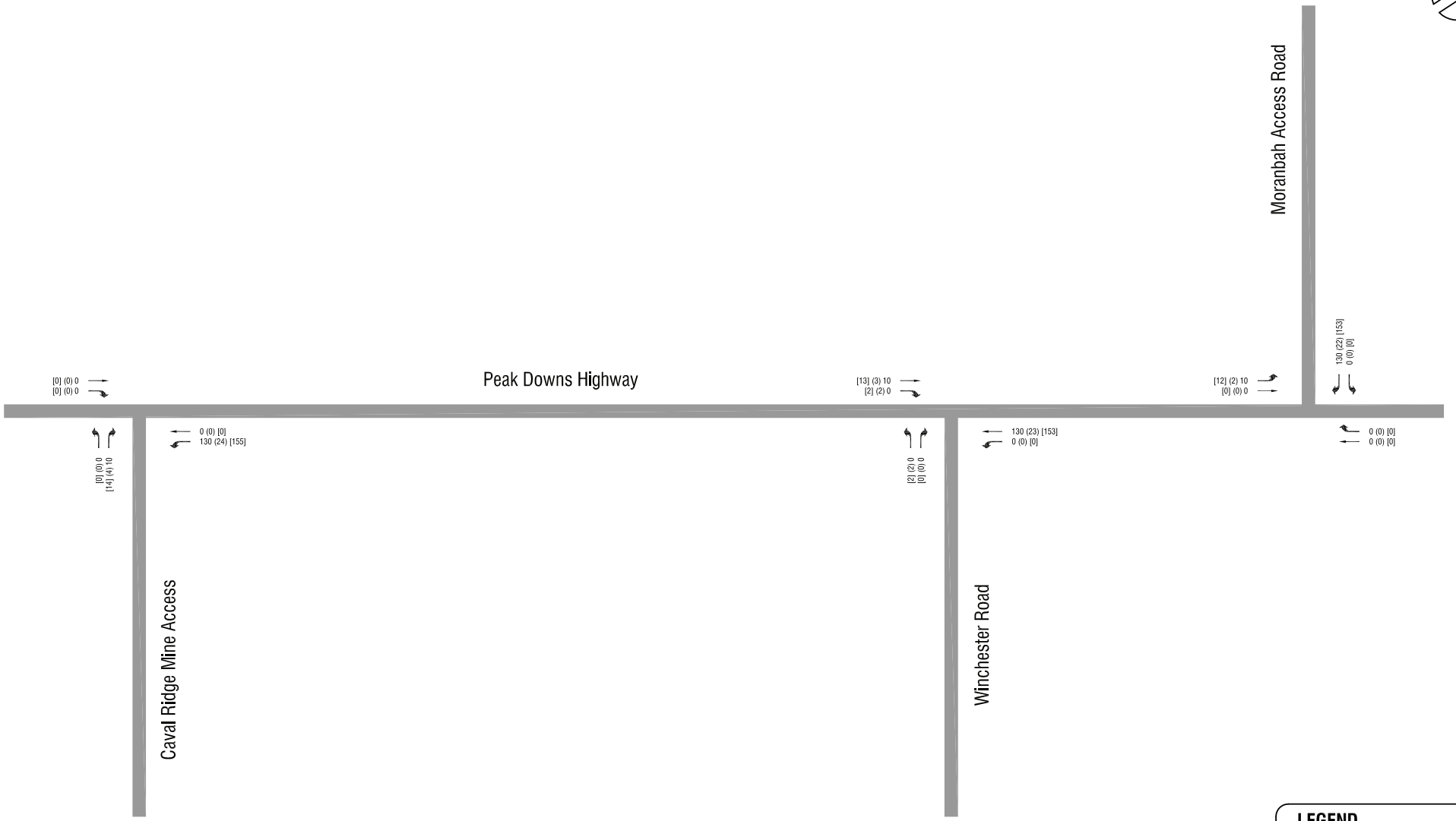

LEGEND

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(0000)	Commercial Vehicles
[0000]	Total Vehicles

A8

Caval Ridge EIS Traffic Study
Development Construction Volumes
AM

Figure No: A8 | Project No: CE005850 | Date: 02/10/2008

Cardno Eppell Olsen

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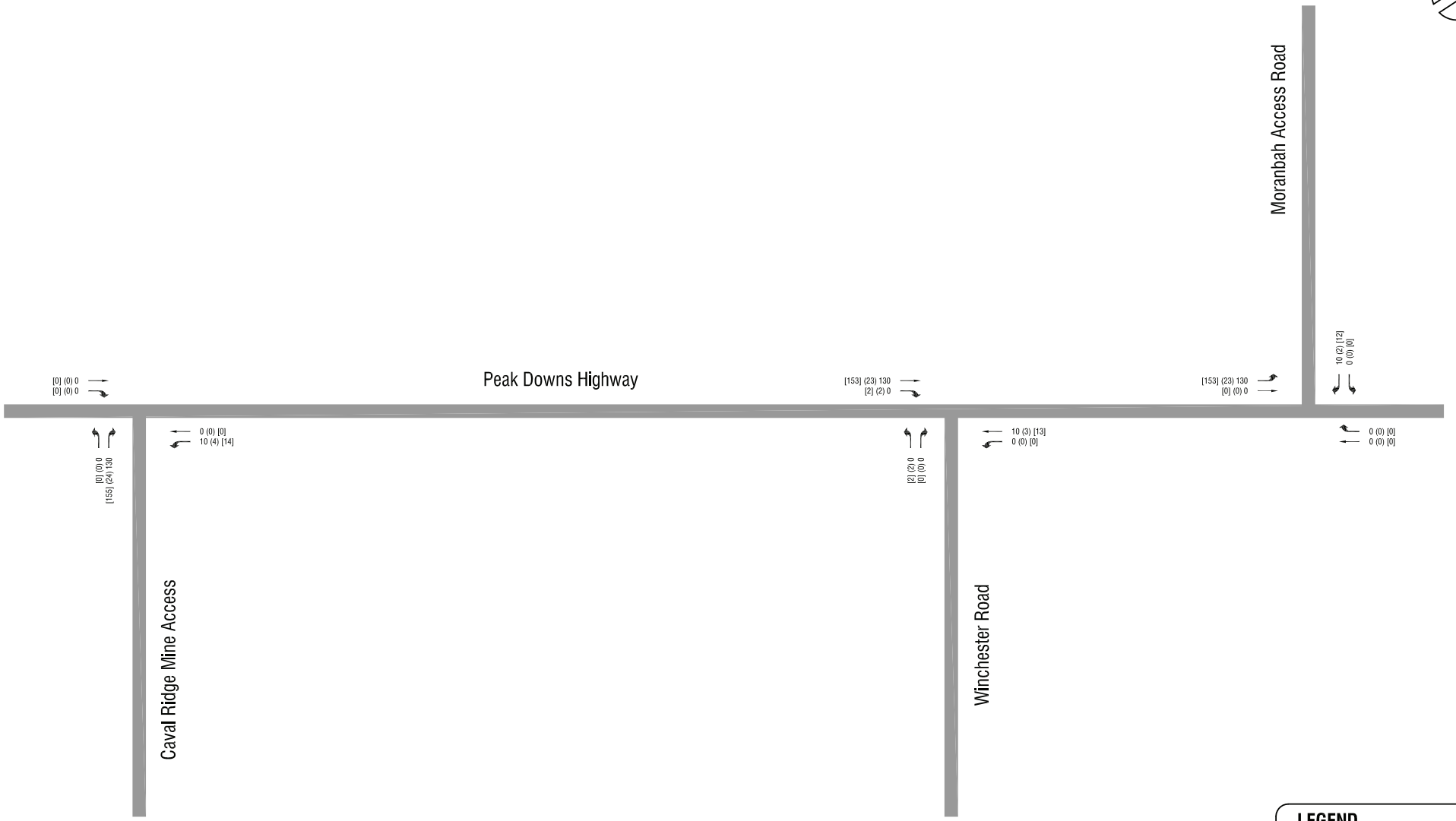

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(0000)	Commercial Vehicles
[0000]	Total Vehicles

A9

Caval Ridge EIS Traffic Study
Development Construction Volumes
PM

Figure No: A9 | Project No: CE005850 | Date: 02/10/2008

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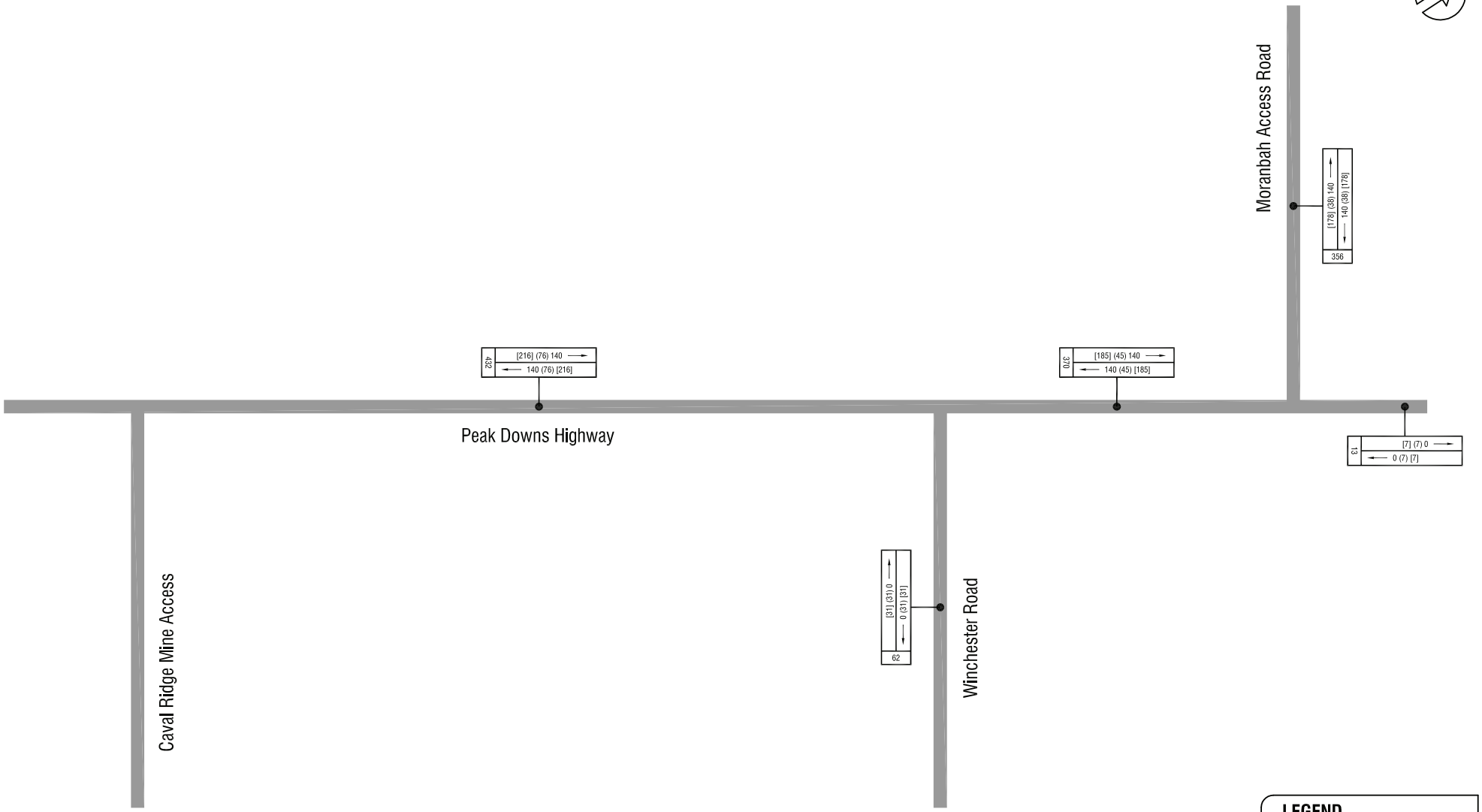

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0000	Light Vehicles
(0000)	Commercial Vehicles
[0000]	Total Vehicles

A10

Caval Ridge EIS Traffic Study
Development Construction Volumes
Daily

Figure No: A10 | Project No: CE005850 | Date: 02/10/2008

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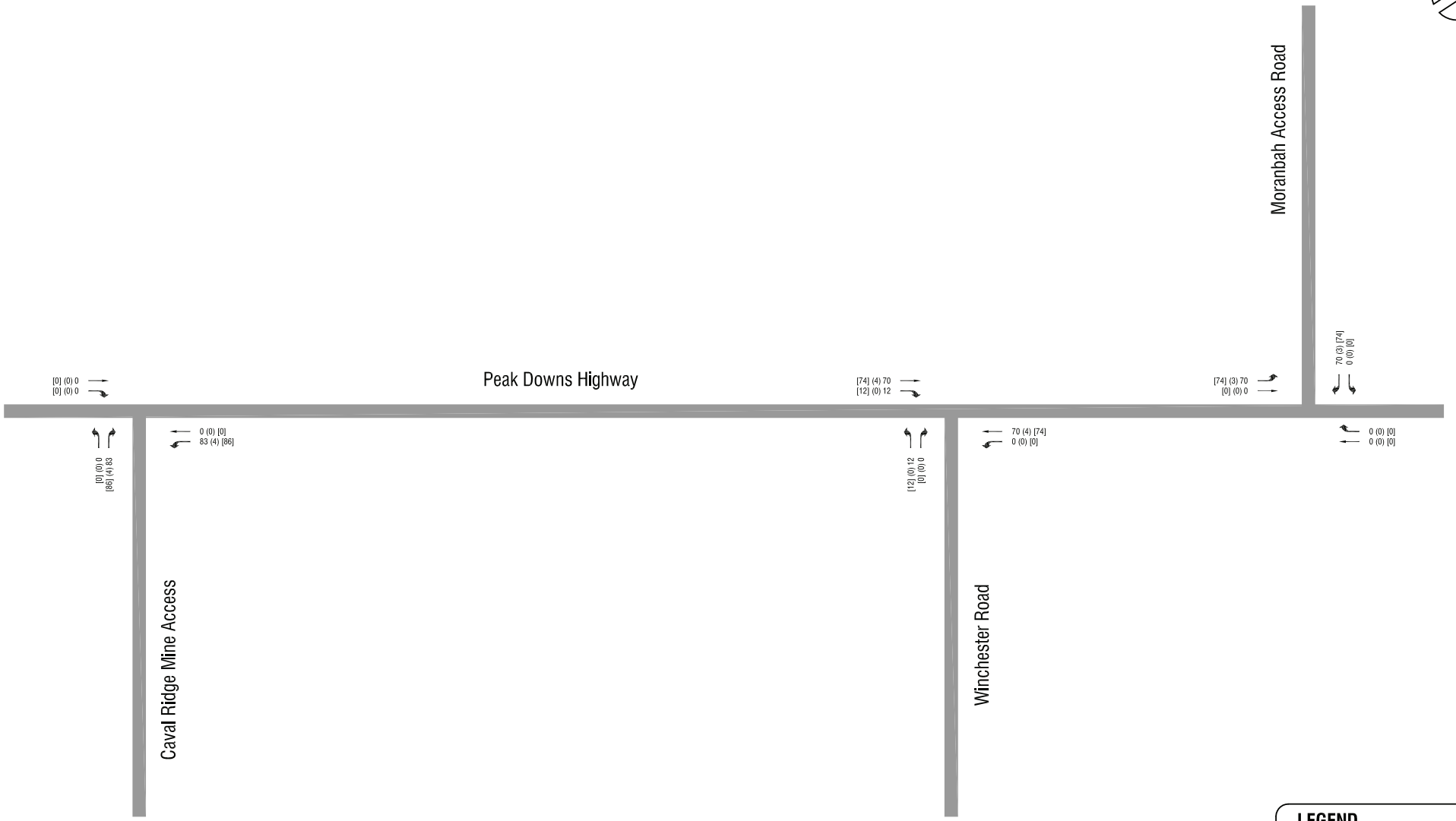

LEGEND

0000	Light Vehicles
(0000)	Commercial Vehicles
[0000]	Total Vehicles

A11

Caval Ridge EIS Traffic Study
Development Operations Volumes
AM

Figure No: A11 | Project No: CE005850 | Date: 02/10/2008

Cardno Eppell Olsen

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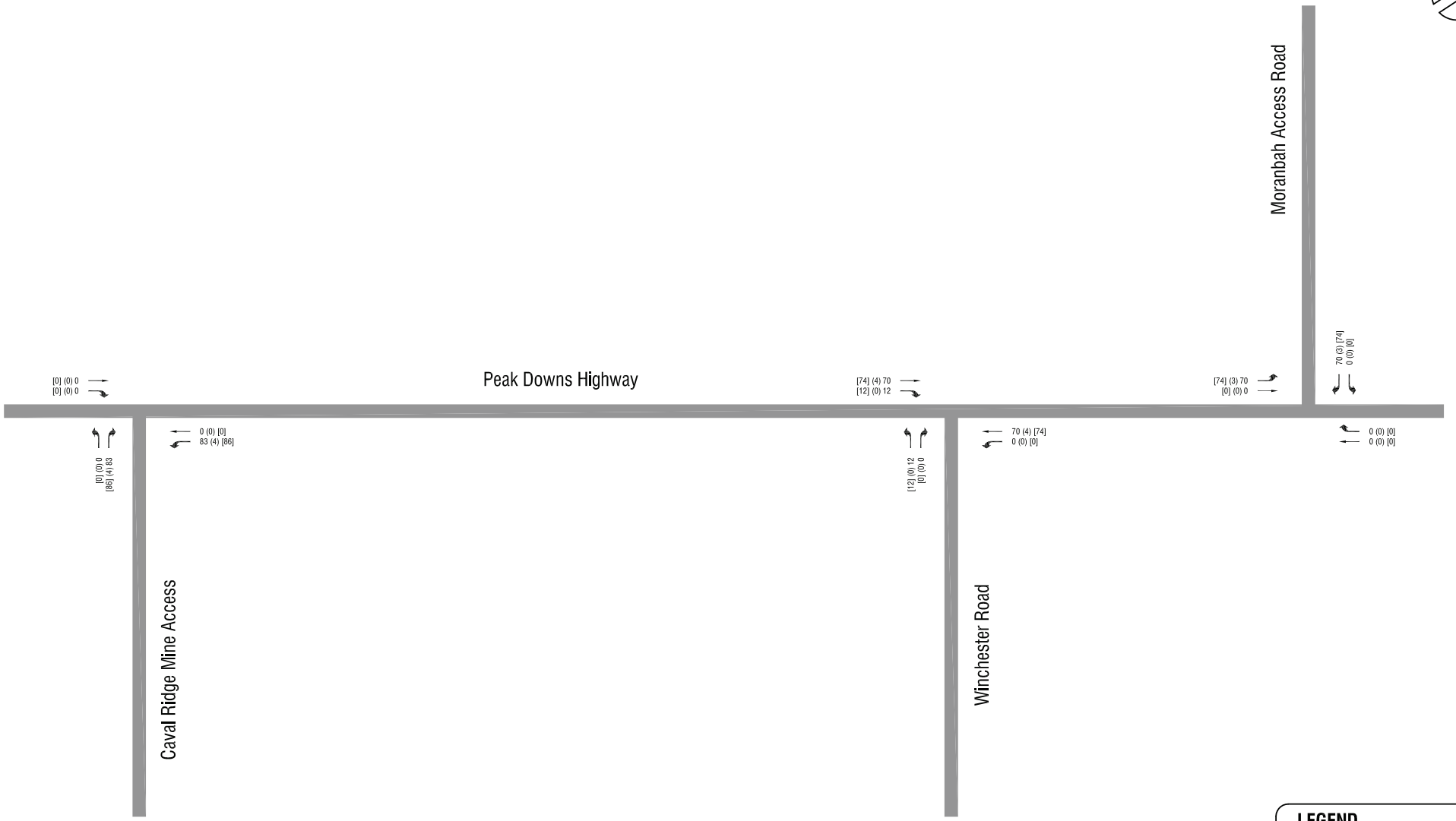

LEGEND

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(0000)	Commercial Vehicles
[0000]	Total Vehicles

A12

Caval Ridge EIS Traffic Study
Development Operations Volumes
PM

Figure No: A12 | Project No: CE005850 | Date: 02/10/2008

Cardno Eppell Olsen

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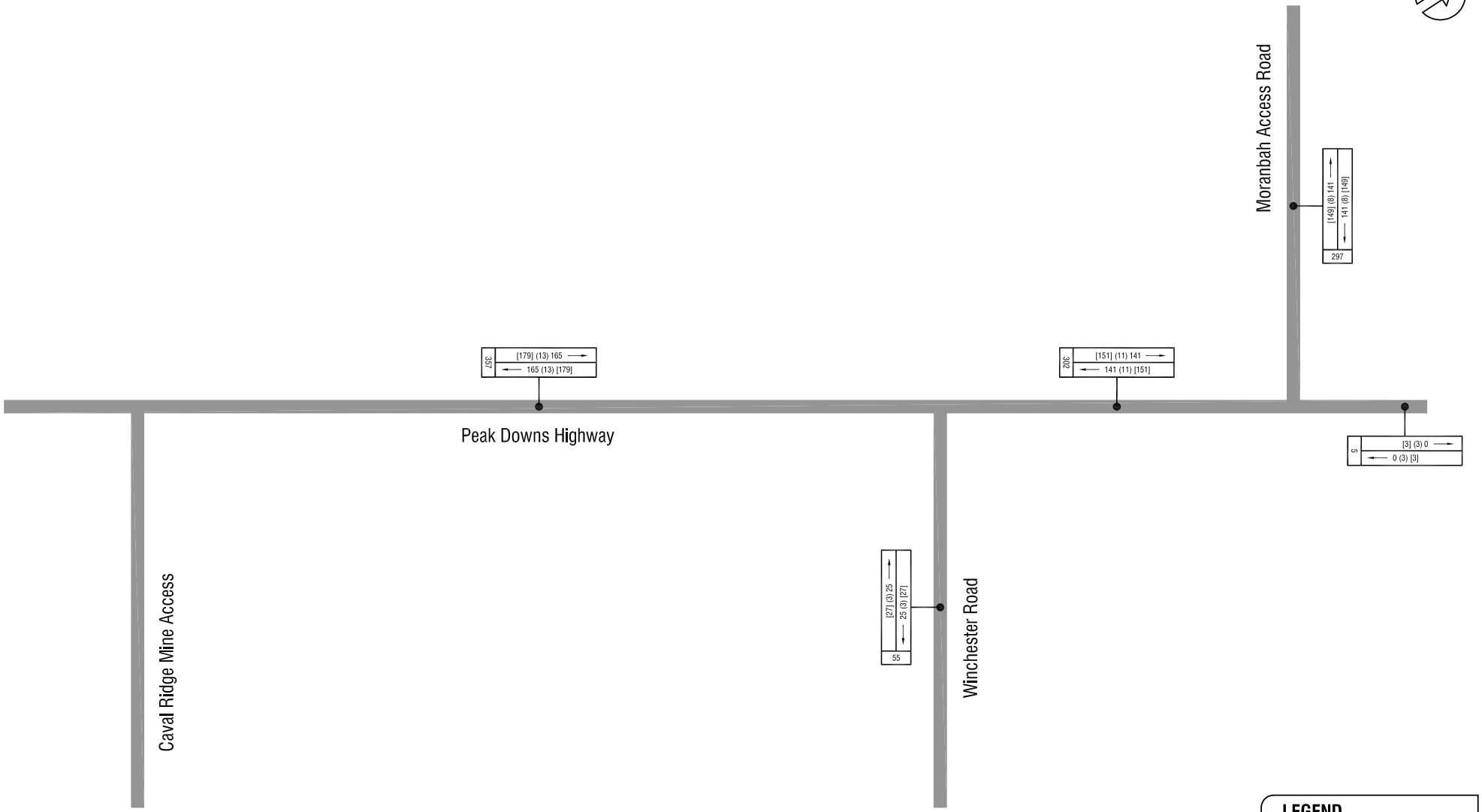


LEGEND

0000	Light Vehicles
(0000)	Commercial Vehicles
[0000]	Total Vehicles

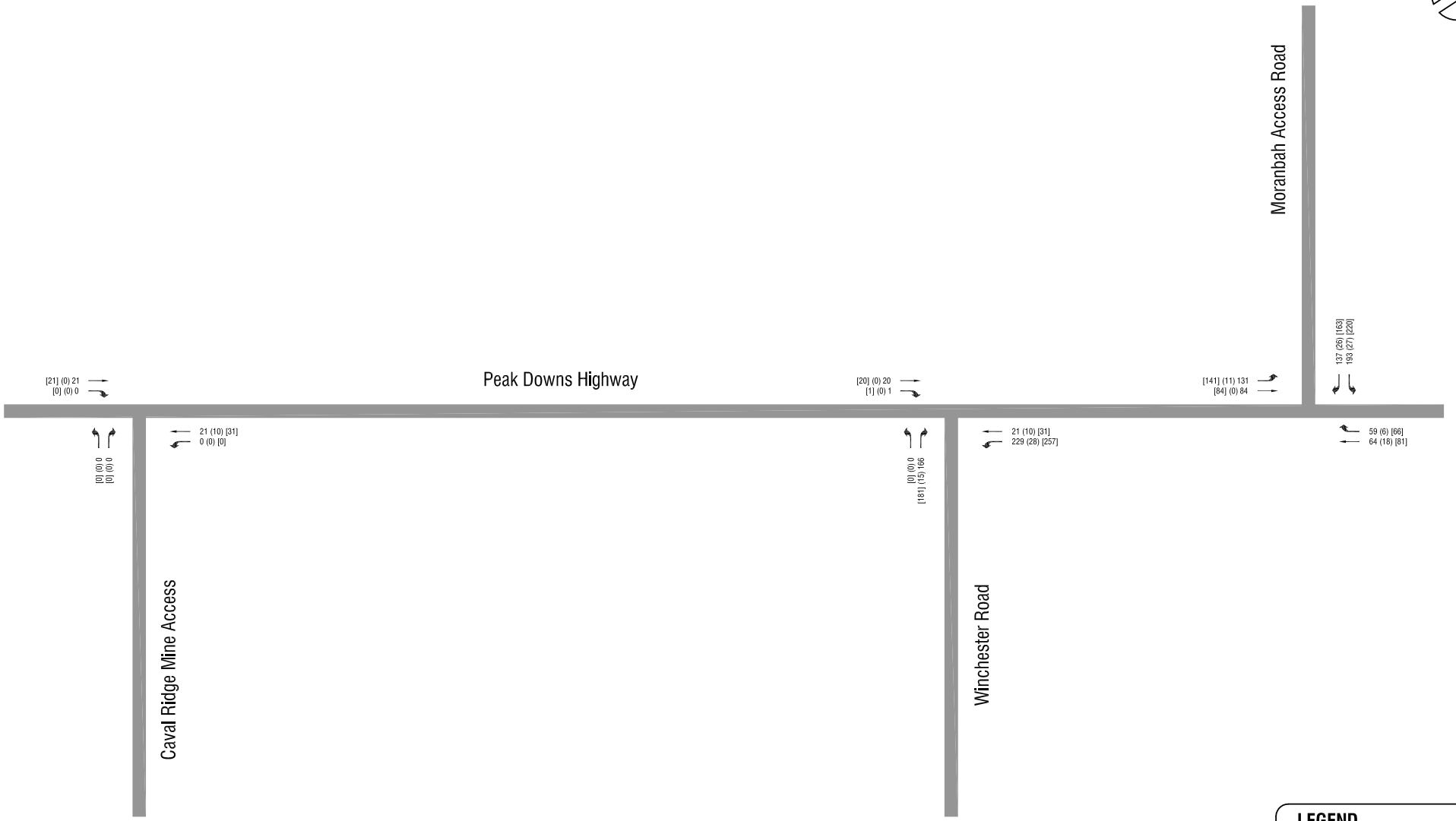
A13

Caval Ridge EIS Traffic Study
Development Operations Volumes
Daily

Figure No: A13 | Project No: CE005850 | Date: 02/10/2008

Cardno Eppell Olsen

FILE NAME: X:/ 5850-Dev Con & Op.dwg



A14

Caval Ridge EIS Traffic Study
2012 Background Volumes
AM

Figure No: A14 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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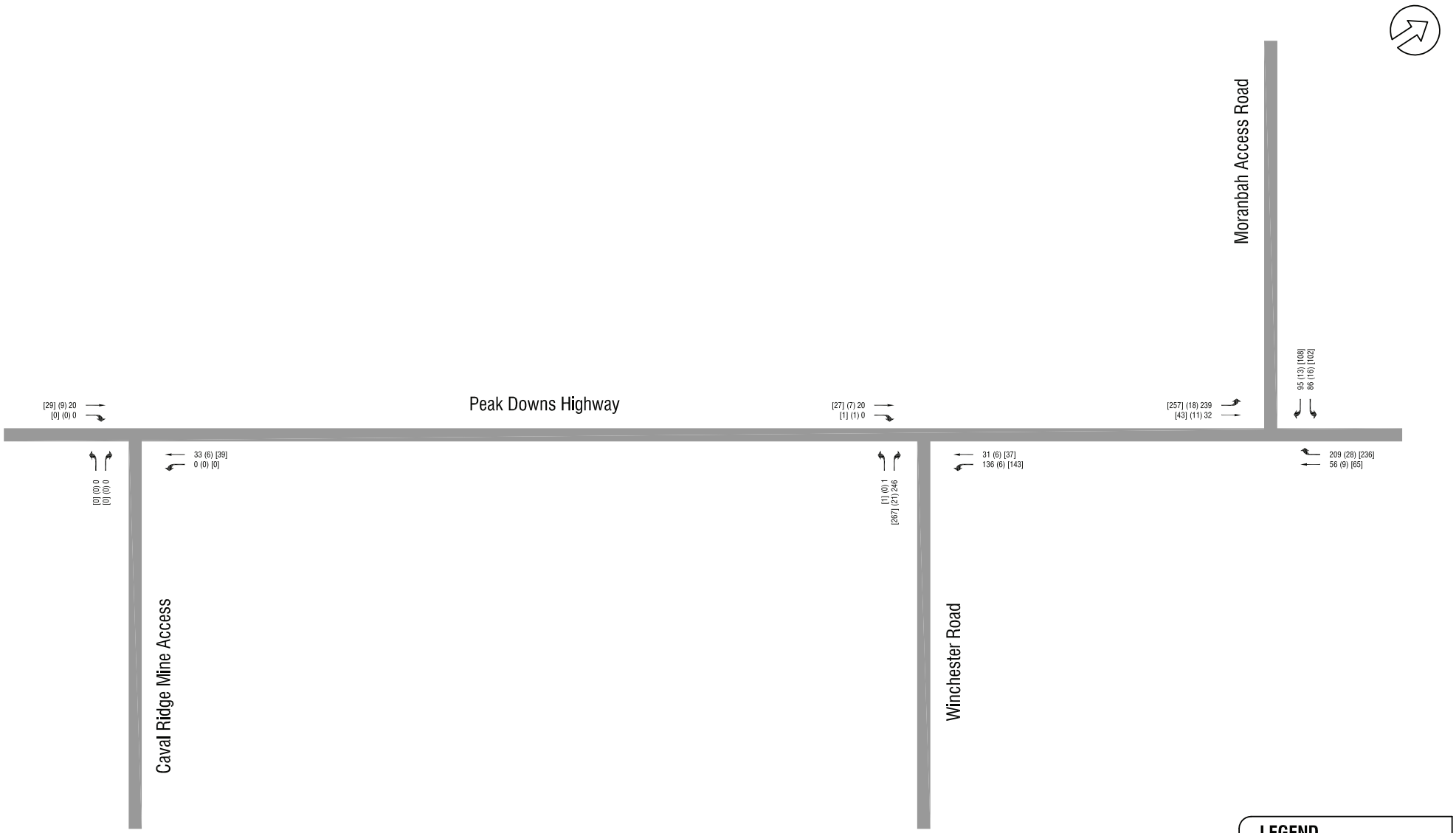

A15

Caval Ridge EIS Traffic Study
2012 Background Volumes
PM

Figure No: A15 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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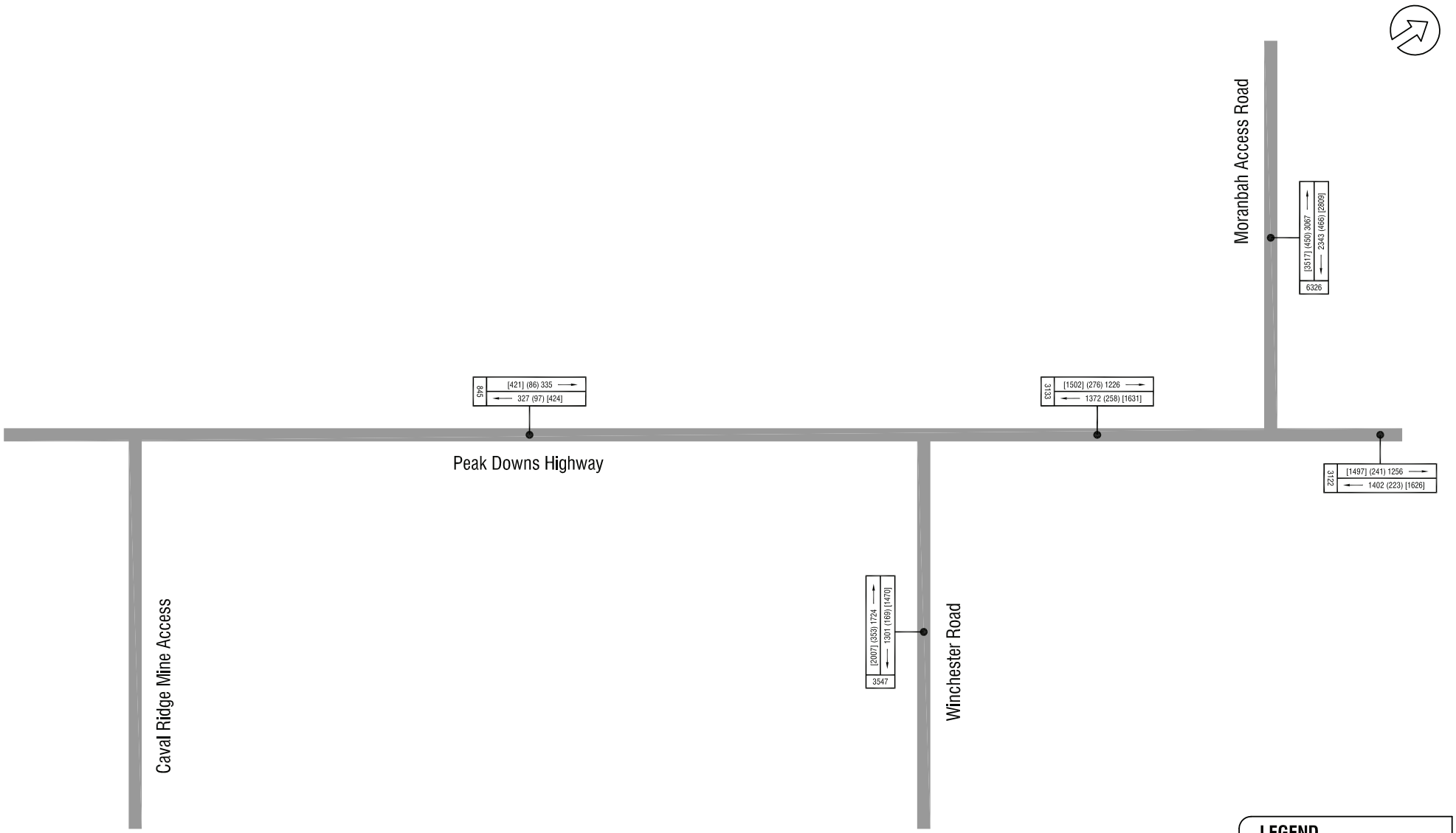

LEGEND

0000	Light Vehicles
(0000)	Commercial Vehicles
[0000]	Total Vehicles

A16

Caval Ridge EIS Traffic Study
2012 Background Volumes
Daily

Figure No: A16 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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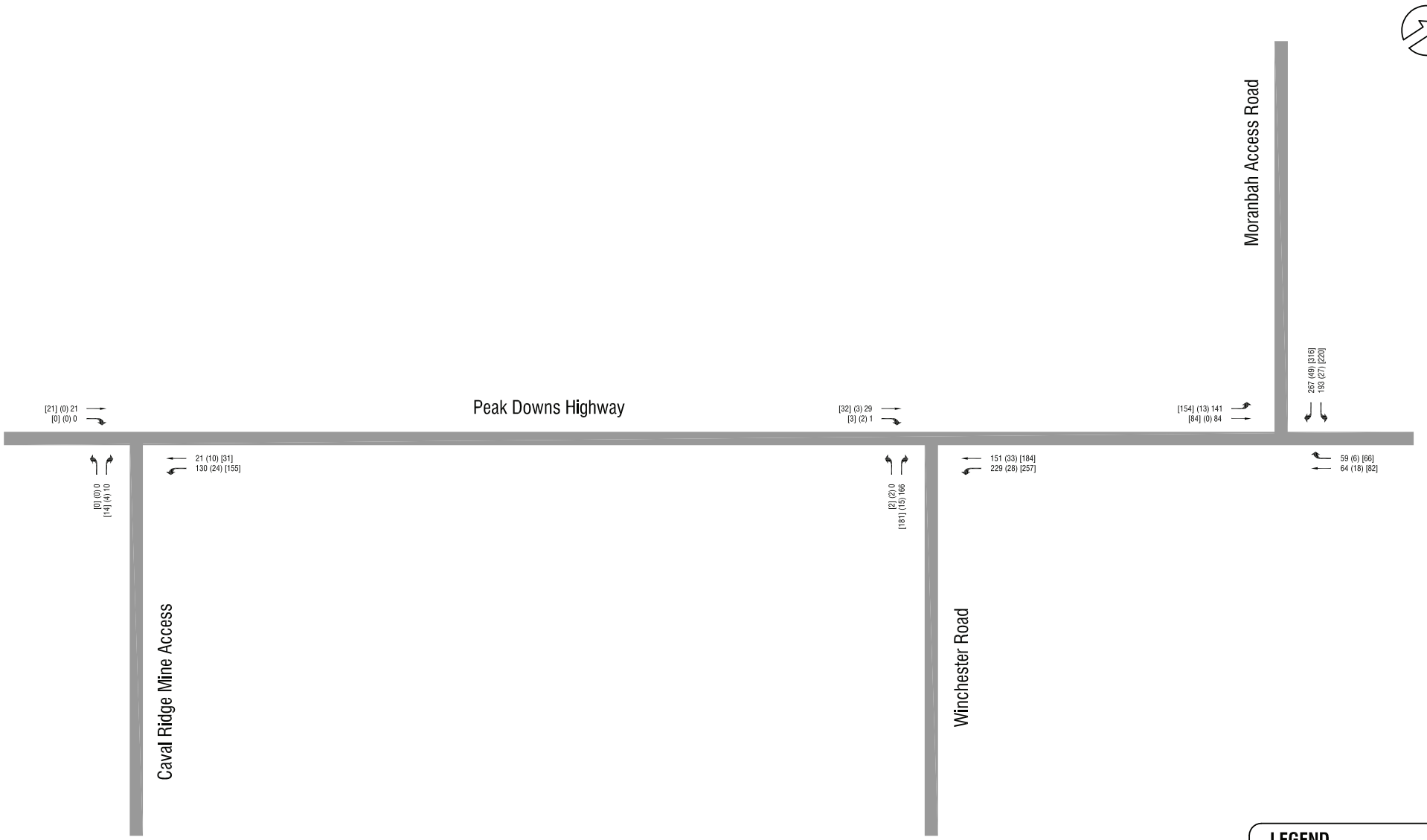

A17

Caval Ridge EIS Traffic Study
2012 Development Volumes
AM

Figure No: A17 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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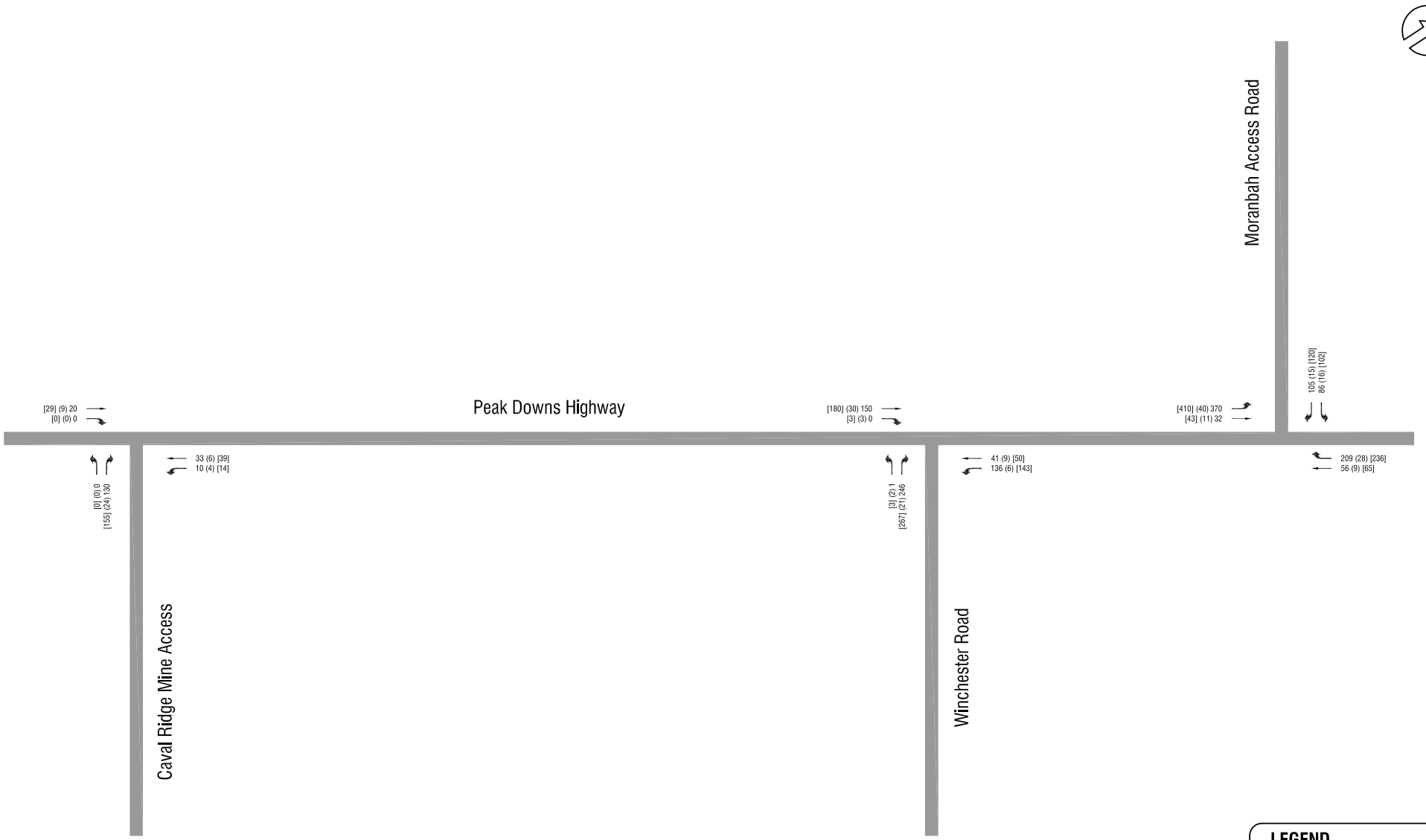

LEGEND

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(0000)	Commercial Vehicles
[0000]	Total Vehicles

A18

Caval Ridge EIS Traffic Study
2012 Development Volumes
PM

Figure No: A18 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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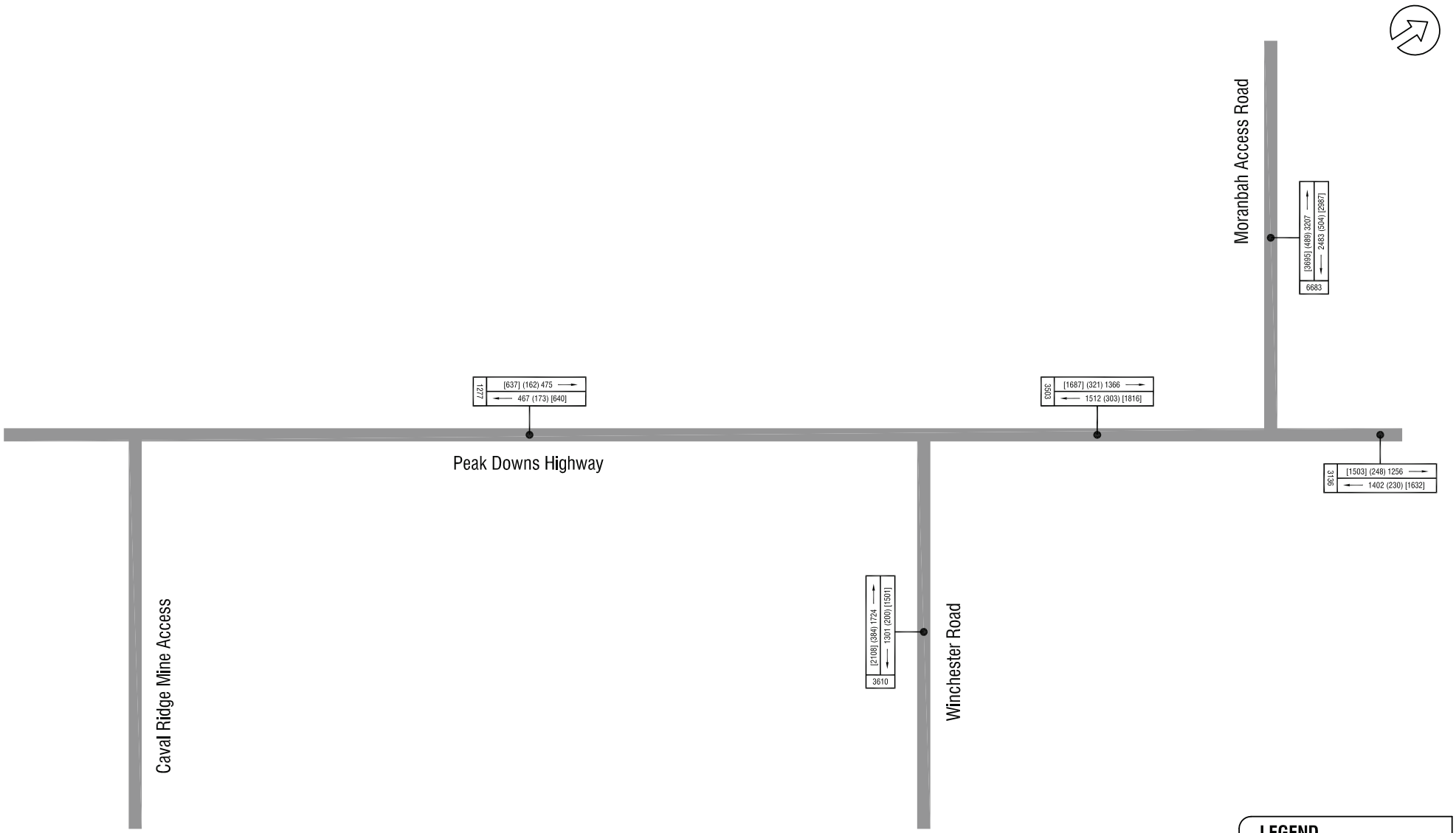

A19

Caval Ridge EIS Traffic Study
2012 Development Volumes
Daily

Figure No: A19 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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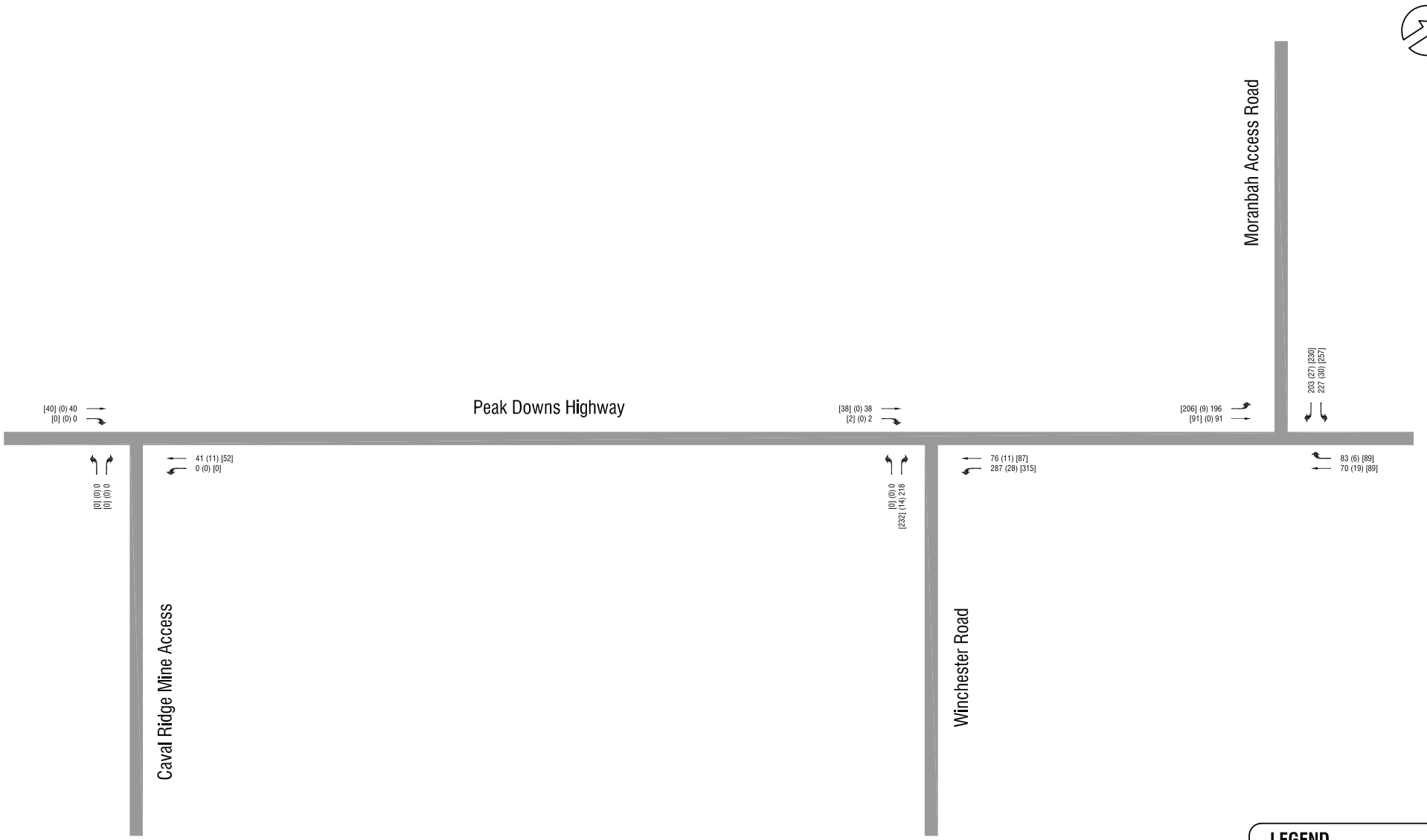

A20

Caval Ridge EIS Traffic Study
2013 Background Volumes
AM

Figure No: A20 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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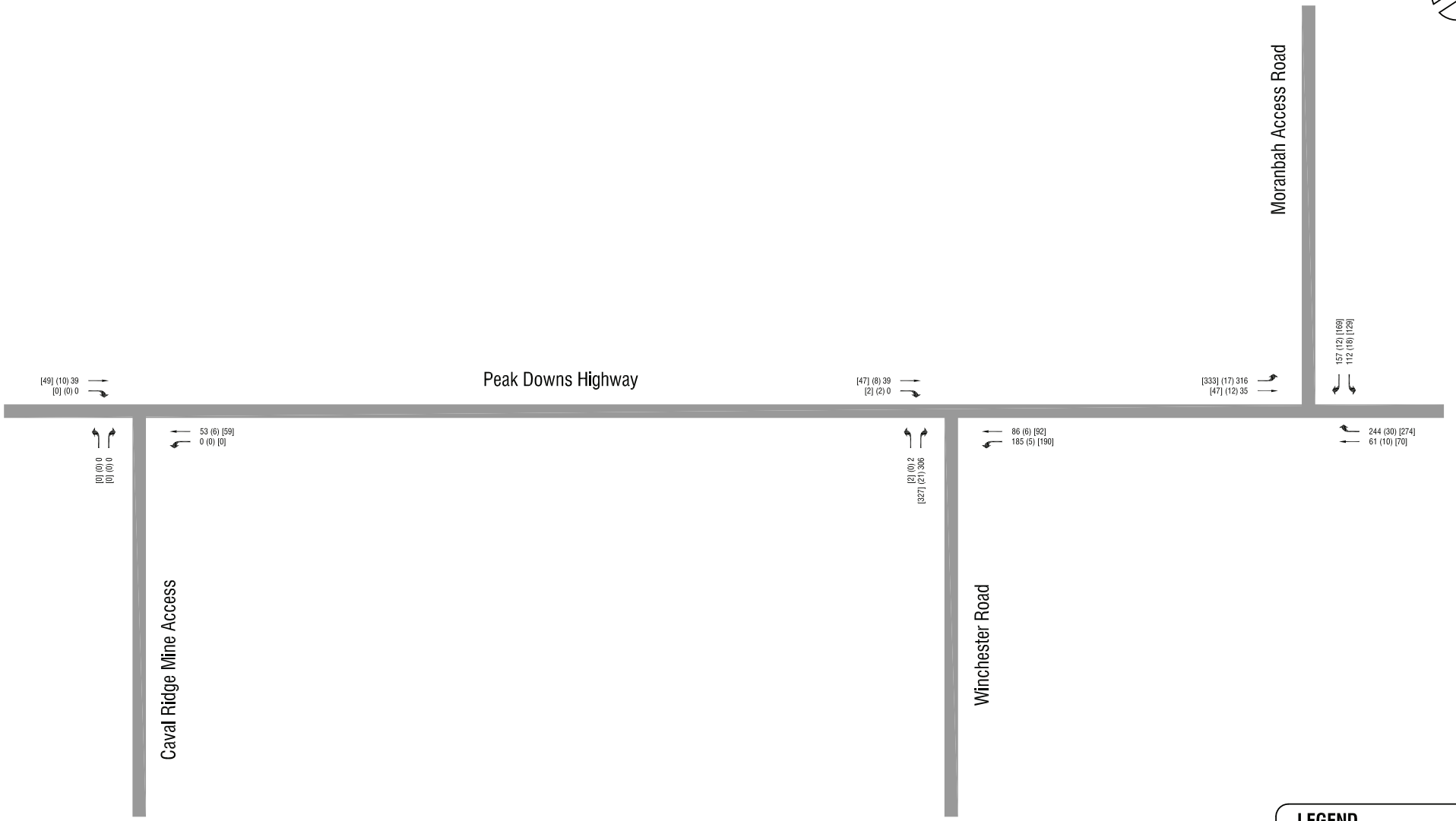

A21

Caval Ridge EIS Traffic Study
2013 Background Volumes
PM

Figure No: A21 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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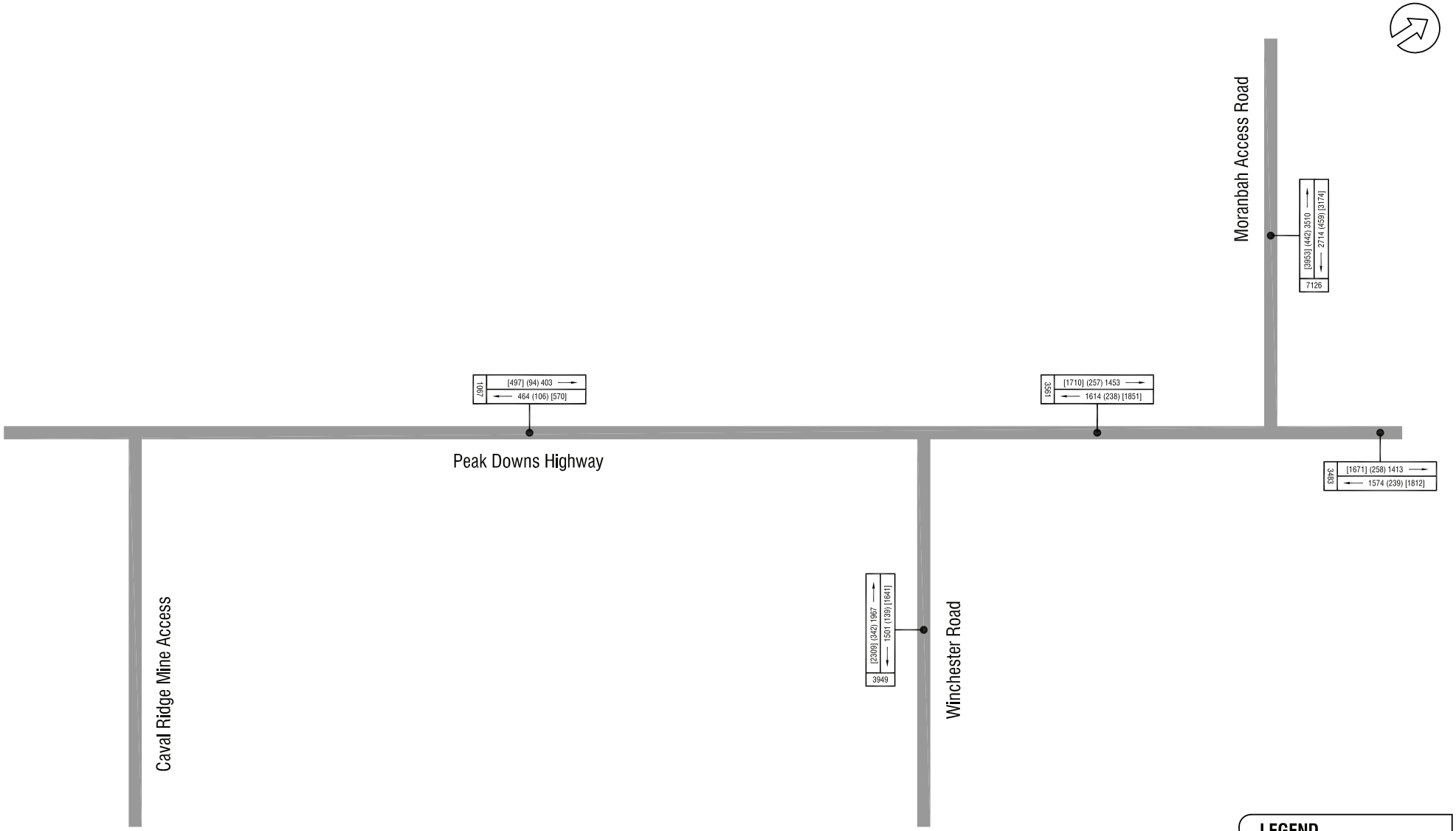

A22

Caval Ridge EIS Traffic Study
2013 Background Volumes
Daily

Figure No: A22 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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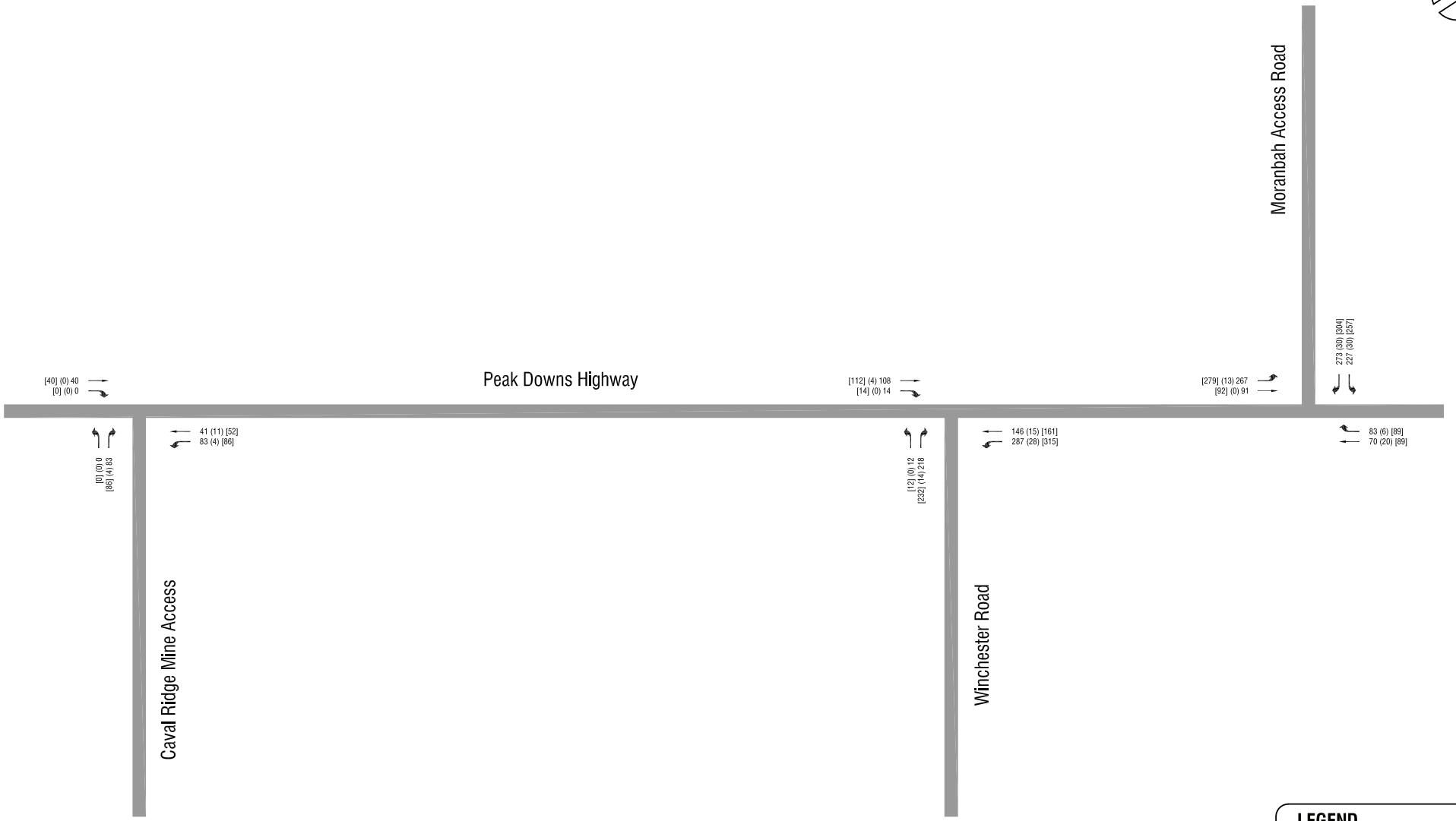

LEGEND

0000	Light Vehicles
(0000)	Commercial Vehicles
[0000]	Total Vehicles

A23

Caval Ridge EIS Traffic Study
2013 Development Volumes
AM

Figure No: A23 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

FILE NAME: X:/ 5850-Figure 14.23-14.25.dwg

A24

Caval Ridge EIS Traffic Study
2013 Development Volumes
PM

Figure No: A24 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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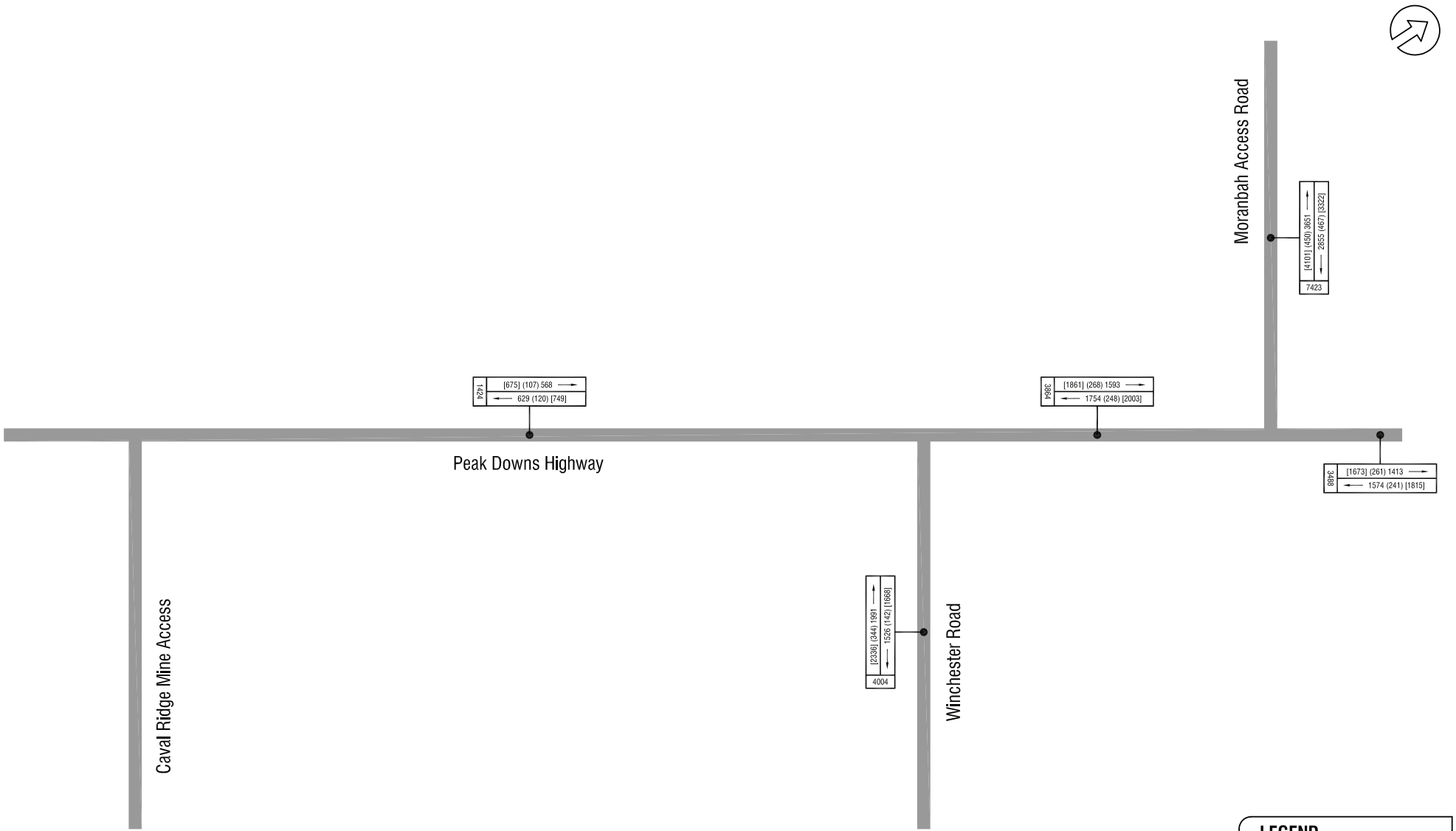

A25

Caval Ridge EIS Traffic Study
2013 Development Volumes
Daily

Figure No: A25 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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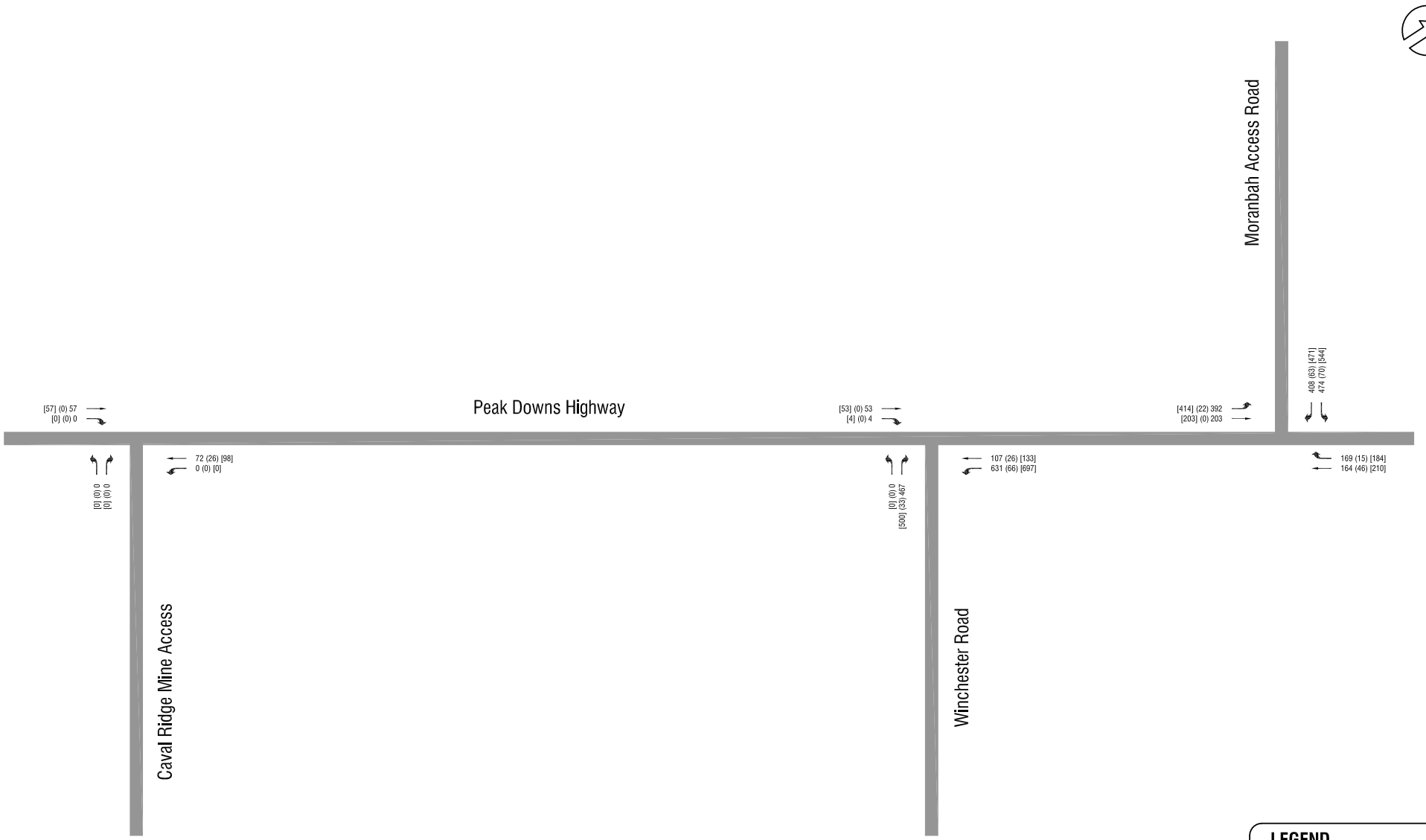

A26

Caval Ridge EIS Traffic Study
2023 Background Volumes
AM

Figure No: A26 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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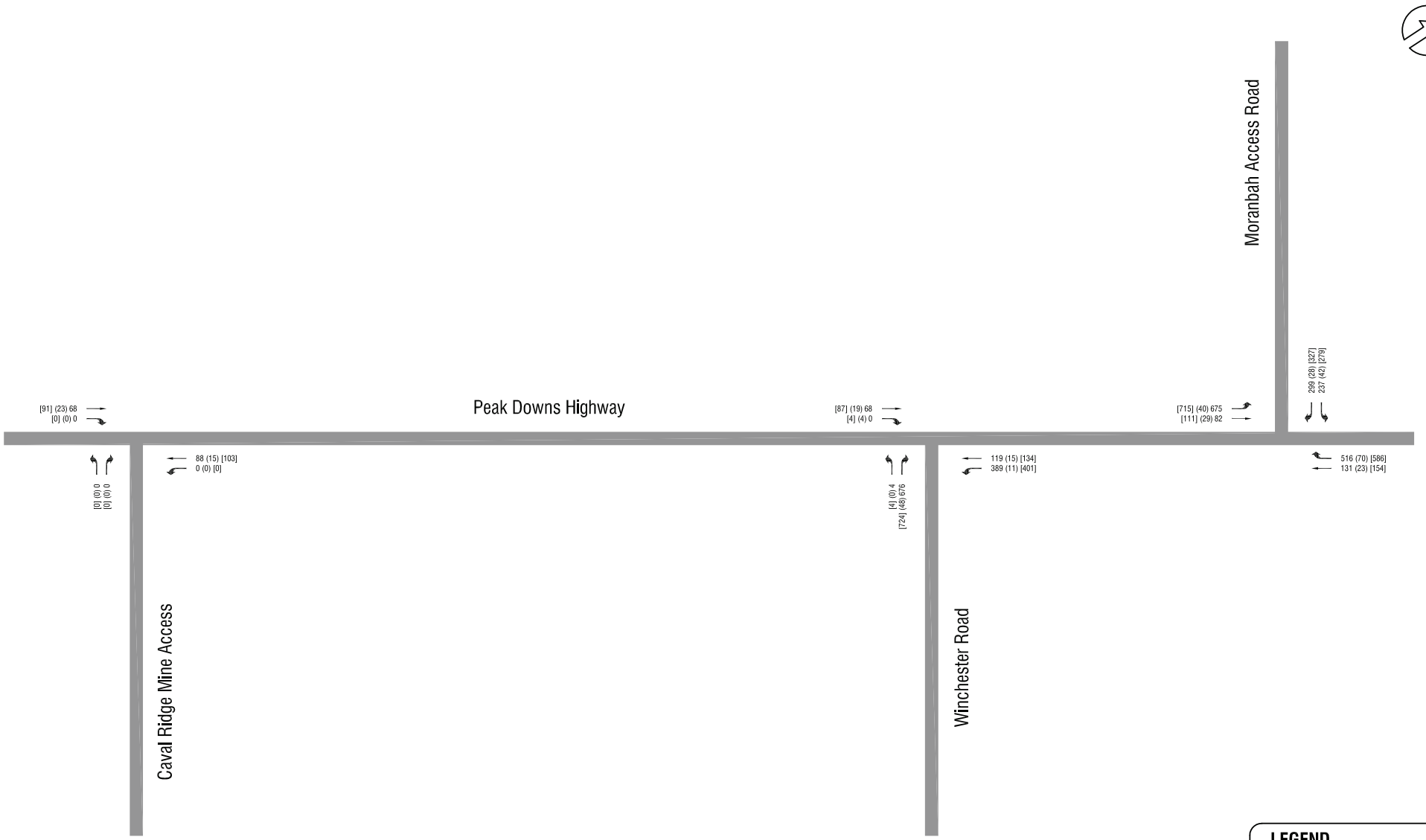

A27

Caval Ridge EIS Traffic Study
2023 Background Volumes
PM

Figure No: A27 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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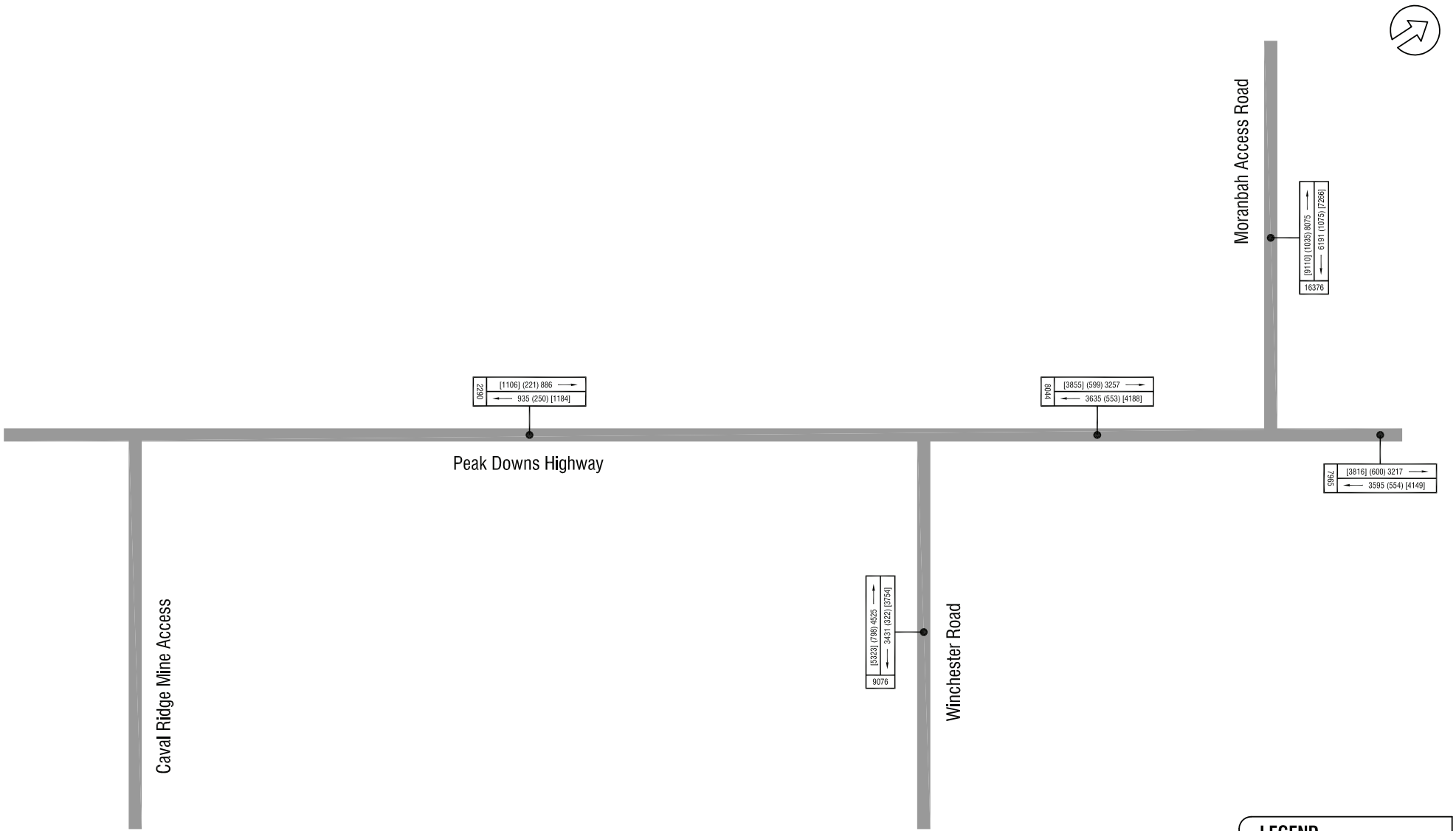

A28

Caval Ridge EIS Traffic Study
2023 Background Volumes
Daily

Figure No: A28 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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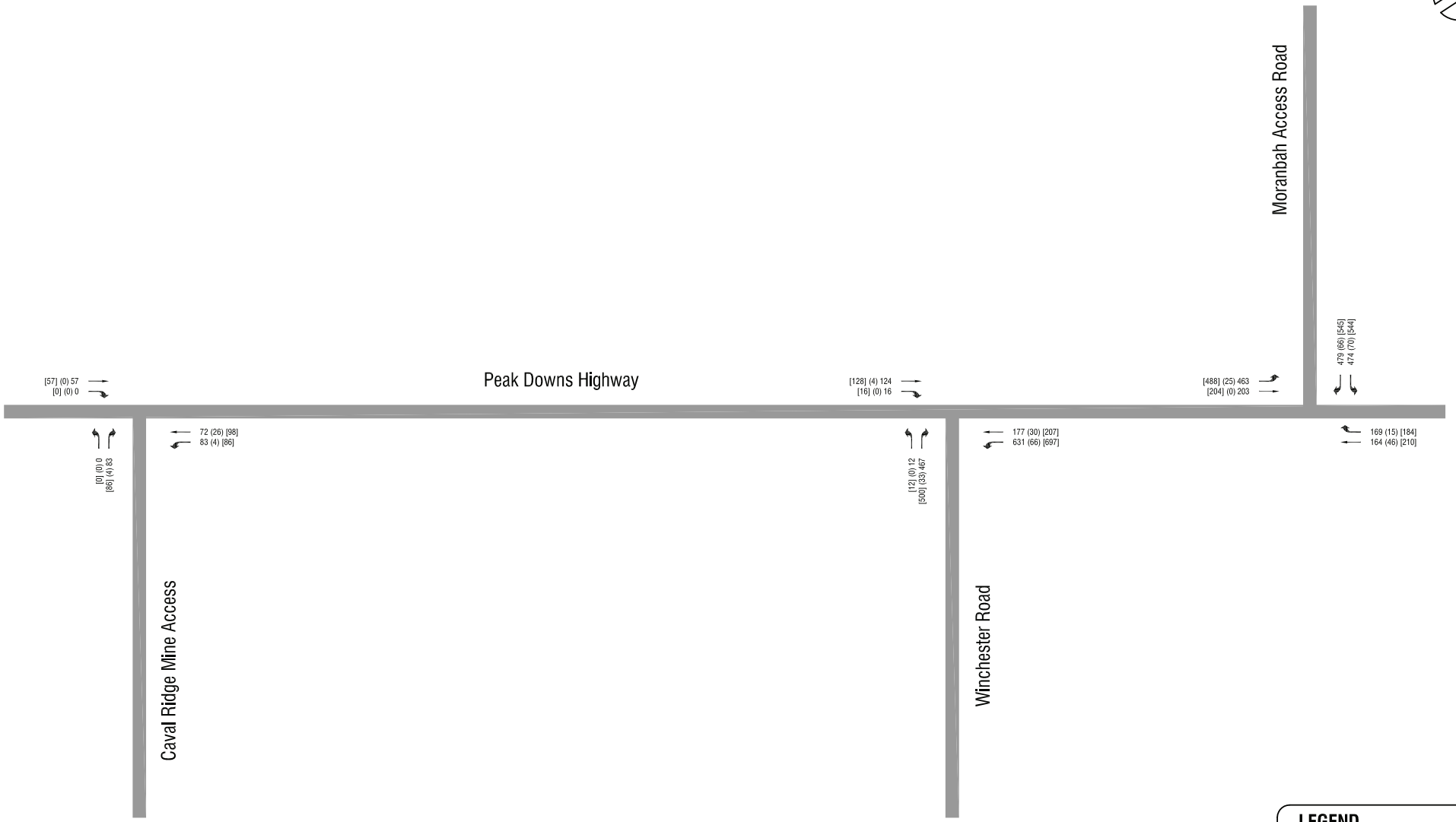

A29

Caval Ridge EIS Traffic Study
2023 Development Volumes
AM

Figure No: A29 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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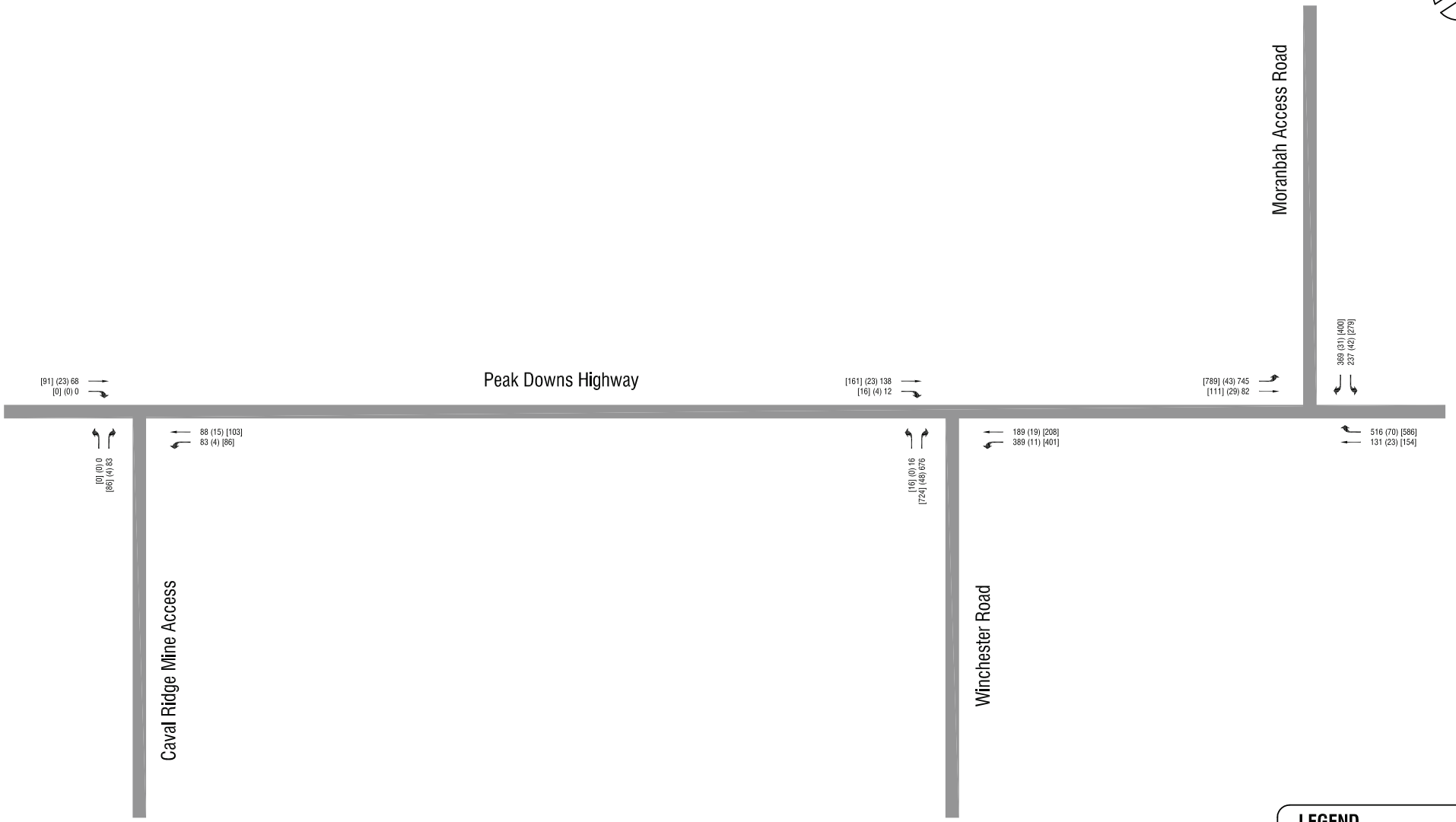

A30

Caval Ridge EIS Traffic Study
2023 Development Volumes
PM

Figure No: A30 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

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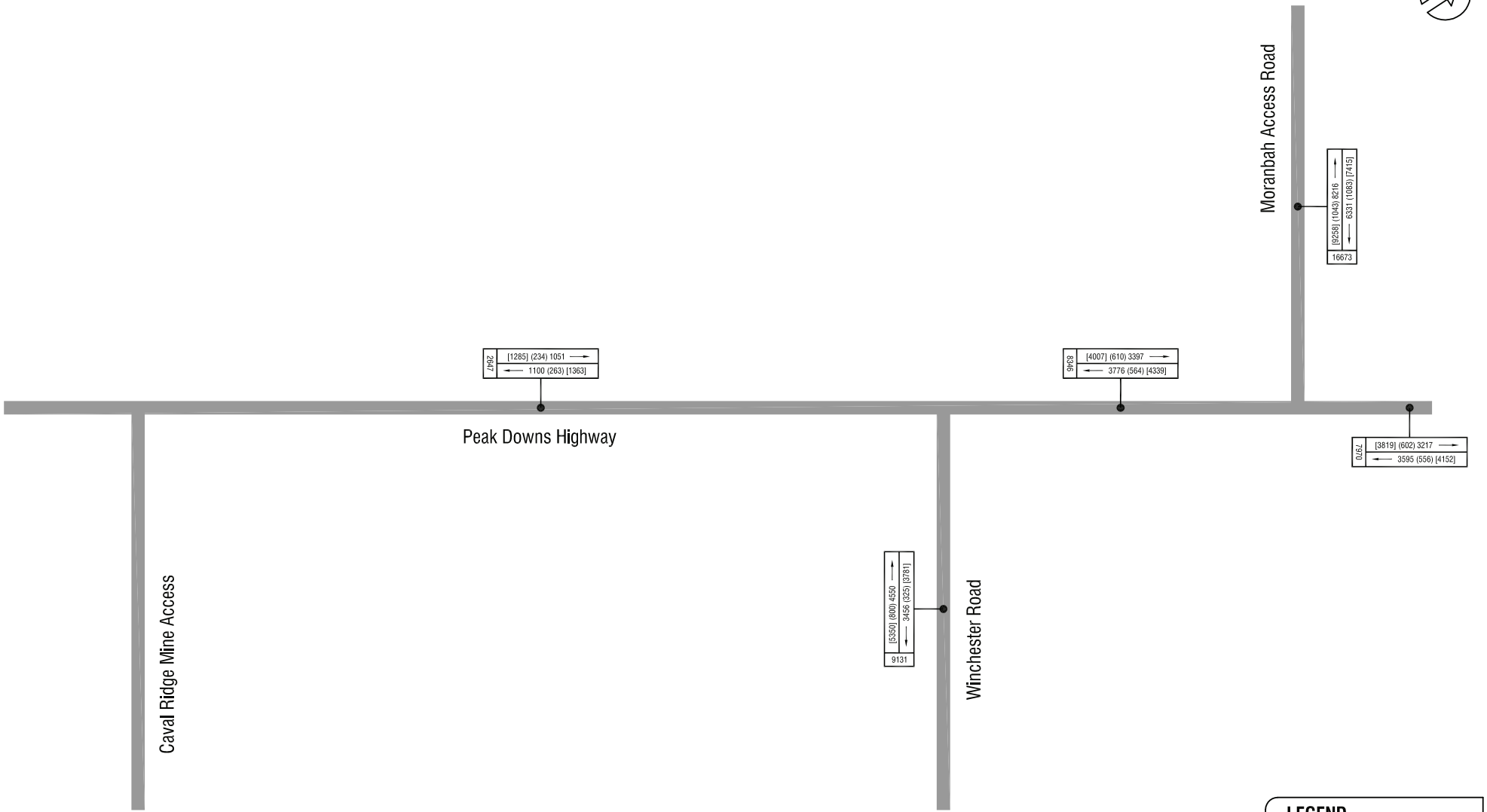

LEGEND

0000	Light Vehicles
(0000)	Commercial Vehicles
[0000]	Total Vehicles

A31

Caval Ridge EIS Traffic Study
2023 Development Volumes
Daily

Figure No: A31 | Project No: CE005850 | Date: 04/02/2009

Cardno Eppell Olsen

FILE NAME: X:/ 5850-Figure 14.29-14.31.dwg

Appendix B

Pavement Impact Assessment Calculations

Figure B.1

Annual Background ESA Loadings (Growthed 2007 Survey Loadings plus Goonyella Riverside Mine Expansion Loadings plus Daunia Mine Development Loadings)

Link		Section	Direction	2009	2010	2011	2012	2013	2014	2015	2016	2017
1	Peak Downs Hwy (33A)	(1) - Inter. Gregory Development Rd to Caval Ridge Mine Access	Eastbound (G)	74,735	82,100	90,359	99,390	109,275	120,202	132,222	145,444	159,989
2	Peak Downs Hwy (33A)	(2) - Caval Ridge Mine Access to Inter. Gregory Development Rd	Westbound (A)	84,573	93,012	102,321	112,553	123,798	136,178	149,796	164,776	181,253
3	Peak Downs Hwy (33A)	(3) - Caval Ridge Mine Access to Inter. Dysart Rd	Eastbound (G)	74,735	82,100	90,359	99,390	109,275	120,202	132,222	145,444	159,989
4	Peak Downs Hwy (33A)	(4) - Inter. Dysart Rd to Caval Ridge Mine Access	Westbound (A)	84,573	93,012	102,321	112,553	123,798	136,178	149,796	164,776	181,253
5	Peak Downs Hwy (33A)	(5) - Inter. Dysart Rd to Inter. Moranbah Access Rd	Eastbound (G)	202,143	222,249	288,918	313,365	300,833	330,415	362,954	398,748	438,121
6	Peak Downs Hwy (33A)	(6) - Inter. Moranbah Access Rd to Inter. Dysart Rd	Westbound (A)	186,198	204,799	230,688	253,216	273,473	300,732	330,716	363,699	399,981
7	Peak Downs Hwy (33A)	(7) - Inter. Moranbah Access Rd to Old Belyando/Nebo Shire Boundary	Eastbound (G)	211,293	222,457	245,385	269,832	297,824	327,405	359,945	395,738	435,111
8	Peak Downs Hwy (33A)	(8) - Old Belyando/Nebo Shire Boundary to Inter. Moranbah Access Rd	Westbound (A)	188,824	205,974	230,926	253,454	279,878	307,137	337,121	370,104	406,386
9	Peak Downs Hwy (33A)	(9) - Old Belyando/Nebo Shire Boundary to No Marker	Eastbound (G)	299,697	319,702	352,354	387,499	427,257	469,782	516,559	568,014	624,614
10	Peak Downs Hwy (33A)	(10) - No Marker to Old Belyando/Nebo Shire Boundary	Westbound (A)	347,562	380,586	422,999	464,734	512,286	562,786	618,335	679,439	746,654
11	Peak Downs Hwy (33A)	(11) - No Marker to Daunia Turnout	Eastbound (G)	299,697	319,702	352,354	387,499	427,257	469,782	516,559	568,014	624,614
12	Peak Downs Hwy (33A)	(12) - Daunia Turnout to No Marker	Westbound (A)	347,562	380,586	422,999	464,734	512,286	562,786	618,335	679,439	746,654
13	Peak Downs Hwy (33A)	(13) - Daunia Turnout to Thirty Mile Ck	Eastbound (G)	207,457	228,197	251,629	276,632	305,234	335,487	368,766	405,372	445,639
14	Peak Downs Hwy (33A)	(14) - Thirty Mile Ck to Daunia Turnout	Westbound (A)	281,962	307,539	342,460	375,953	414,438	454,965	499,544	548,581	602,521
15	Peak Downs Hwy (33A)	(15) - Thirty Mile Ck to Inter. Fitzory Development Rd	Eastbound (G)	207,457	228,197	251,629	276,632	305,234	335,487	368,766	405,372	445,639
16	Peak Downs Hwy (33A)	(16) - Inter. Fitzory Development Rd to Thirty Mile Ck	Westbound (A)	281,962	307,539	342,460	375,953	414,438	454,965	499,544	548,581	602,521
17	Peak Downs Hwy (33A)	(17) - Inter. Fitzory Development Rd to Inter. Oxford Downs - Sarina Rd	Eastbound (G)	347,664	382,425	421,280	463,247	510,511	561,292	617,151	678,596	746,185
18	Peak Downs Hwy (33A)	(18) - Inter. Oxford Downs - Sarina Rd to Inter. Fitzory Development Rd	Westbound (A)	369,605	403,947	448,508	492,606	542,756	596,115	654,809	719,372	790,392
19	Peak Downs Hwy (33B)	(19) - Inter. Oxford Downs - Sarina Rd to Inter. Reynolds St & Cemetery Access Rd	Eastbound (G)	382,209	420,424	463,080	509,227	561,089	616,927	678,350	745,914	820,235
20	Peak Downs Hwy (33B)	(20) - Inter. Reynolds St & Cemetery Access Rd to Inter. Oxford Downs - Sarina Rd	Westbound (A)	376,707	411,759	457,101	502,059	553,154	607,553	667,391	733,212	805,616
21	Peak Downs Hwy (33B)	(21) - Inter. Reynolds St & Cemetery Access Rd to Denison Ck Bridge	Eastbound (G)	418,590	460,443	507,101	557,650	614,354	675,519	742,801	816,811	898,221
22	Peak Downs Hwy (33B)	(22) - Denison Ck Bridge to Inter. Reynolds St & Cemetery Access Rd	Westbound (A)	421,663	461,211	511,499	561,895	618,975	679,955	747,033	820,819	901,984
23	Peak Downs Hwy (33B)	(23) - Denison Ck Bridge to Inter. Eton - Homebush Rd	Eastbound (G)	414,471	455,912	502,117	552,168	608,324	668,886	735,504	808,784	889,392
24	Peak Downs Hwy (33B)	(24) - Inter. Eton - Homebush Rd to Denison Ck Bridge	Westbound (A)	375,986	392,425	416,366	436,807	459,914	482,451	506,115	530,962	557,052
25	Peak Downs Hwy (33B)	(25) - Inter. Eton - Homebush Rd to Camerons Rd	Eastbound (G)	468,669	492,138	517,403	543,192	571,371	599,805	629,660	661,008	693,923
26	Peak Downs Hwy (33B)	(26) - Camerons Rd to Inter. Eton - Homebush Rd	Westbound (A)	412,314	430,570	456,418	478,862	504,072	528,817	554,799	582,080	610,726
27	Peak Downs Hwy (33B)	(27) - Camerons Rd to Inter. Mackay - Eungella Rd	Eastbound (G)	509,774	535,299	562,721	590,777	621,336	652,267	684,745	718,847	754,654
28	Peak Downs Hwy (33B)	(28) - Inter. Mackay - Eungella Rd to Camerons Rd	Westbound (A)	517,103	540,598	571,947	600,168	631,443	662,556	695,226	729,528	765,546

Figure B.2

Cardno Eppell Olsen

Pavement Rehabilitation Assessment

Road		Section	Direction	Roughness Count*	Count Year	Roughness Count Deficiency	Roughness Deterioration Rate	Background				With Development				Bring Forward Time Period (Years)	Developer Bring Forward Responsibility
								Rehabilitation Year	ESA Load at Rehabilitation Year (rounded)	ESA Load 1 Year After Rehabilitation Year	ESA Load at Breakpoint	Rehabilitation Year (rounded)	ESA Load at Rehabilitation Year (rounded)	ESA Load 1 Year After Rehabilitation Year	Rehabilitation Year		
1	Peak Downs Hwy (33A)	(1) - Inter. Gregory Development Rd to Caval Ridge Mine Access	Eastbound (G)	88.03	2007	120.0	3.0	2017.7	1,013,715	1,189,703	1,136,907	2017	1,013,814	1,189,802	2017.7	0.0	No
2	Peak Downs Hwy (33A)	(2) - Caval Ridge Mine Access to Inter. Gregory Development Rd	Westbound (A)	88.03	2007	120.0	3.0	2017.7	1,148,261	1,347,639	1,287,826	2017	1,148,278	1,347,657	2017.7	0.0	No
3	Peak Downs Hwy (33A)	(3) - Caval Ridge Mine Access to Inter. Dysart Rd	Eastbound (G)	62.75	2007	120.0	3.0	2026.1	3,111,394	3,391,089	3,139,364	2025	3,008,739	3,290,546	2025.5	0.6	No
4	Peak Downs Hwy (33A)	(4) - Inter. Dysart Rd to Caval Ridge Mine Access	Westbound (A)	62.75	2007	120.0	3.0	2026.1	3,524,744	3,841,613	3,556,431	2025	3,421,448	3,740,982	2025.4	0.7	No
5	Peak Downs Hwy (33A)	(5) - Inter. Dysart Rd to Inter. Moranbah Access Rd	Eastbound (G)	51.46	2007	120.0	3.0	2029.8	10,936,822	11,769,202	11,602,726	2029	11,146,752	11,989,392	2029.5	0.3	No
6	Peak Downs Hwy (33A)	(6) - Inter. Moranbah Access Rd to Inter. Dysart Rd	Westbound (A)	51.46	2007	120.0	3.0	2029.8	9,943,352	10,706,637	10,553,980	2029	10,195,271	10,970,449	2029.5	0.3	No
7	Peak Downs Hwy (33A)	(7) - Inter. Moranbah Access Rd to Old Belyando/Nebo Shire Boundary	Eastbound (G)	58.96	2007	120.0	3.0	2027.3	9,220,800	10,002,677	9,455,363	2027	9,240,432	10,023,548	2027.3	0.0	No
8	Peak Downs Hwy (33A)	(8) - Old Belyando/Nebo Shire Boundary to Inter. Moranbah Access Rd	Westbound (A)	58.96	2007	120.0	3.0	2027.3	8,583,104	9,309,028	8,800,881	2027	8,652,750	9,382,878	2027.2	0.1	No
9	Peak Downs Hwy (33A)	(9) - Old Belyando/Nebo Shire Boundary to No Marker	Eastbound (G)	59.15	2007	120.0	3.0	2027.3	13,237,232	14,360,339	13,574,164	2027	13,256,864	14,381,211	2027.3	0.0	No
10	Peak Downs Hwy (33A)	(10) - No Marker to Old Belyando/Nebo Shire Boundary	Westbound (A)	59.15	2007	120.0	3.0	2027.3	15,794,944	17,133,576	16,196,534	2027	15,864,590	17,207,426	2027.2	0.1	No
11	Peak Downs Hwy (33A)	(11) - No Marker to Daunia Turnout	Eastbound (G)	71.12	2007	120.0	3.0	2023.3	9,061,963	10,060,053	9,361,390	2023	9,076,638	10,075,968	2023.3	0.0	No
12	Peak Downs Hwy (33A)	(12) - Daunia Turnout to No Marker	Westbound (A)	71.12	2007	120.0	3.0	2023.3	10,817,055	12,007,225	11,174,106	2023	10,869,883	12,064,257	2023.3	0.0	No
13	Peak Downs Hwy (33A)	(13) - Daunia Turnout to Thirty Mile Ck	Eastbound (G)	68.95	2007	120.0	3.0	2024.0	7,169,150	7,901,747	7,169,150	2023	6,472,487	7,185,065	2024.0	0.0	No
14	Peak Downs Hwy (33A)	(14) - Thirty Mile Ck to Daunia Turnout	Westbound (A)	68.95	2007	120.0	3.0	2024.0	9,686,961	10,673,888	9,686,961	2023	8,781,340	9,743,993	2023.9	0.1	No
15	Peak Downs Hwy (33A)	(15) - Thirty Mile Ck to Inter. Fitzory Development Rd	Eastbound (G)	44.45	2007	120.0	3.0	2032.2	13,680,336	14,606,745	13,865,618	2032	13,706,165	14,633,814	2032.2	0.0	No
16	Peak Downs Hwy (33A)	(16) - Inter. Fitzory Development Rd to Thirty Mile Ck	Westbound (A)	44.45	2007	120.0	3.0	2032.2	18,451,801	19,696,505	18,700,741	2032	18,542,468	19,791,376	2032.1	0.1	No
17	Peak Downs Hwy (33A)	(17) - Inter. Fitzory Development Rd to Inter. Oxford Downs - Sarina Rd	Eastbound (G)	60.25	2007	120.0	3.0	2026.9	14,500,759	15,803,225	15,672,978	2026	14,519,152	15,822,857	2026.9	0.0	No
18	Peak Downs Hwy (33A)	(18) - Inter. Oxford Downs - Sarina Rd to Inter. Fitzory Development Rd	Westbound (A)	60.25	2007	120.0	3.0	2026.9	15,343,545	16,718,455	16,580,964	2026	15,408,986	16,788,100	2026.8	0.1	No
19	Peak Downs Hwy (33B)	(19) - Inter. Oxford Downs - Sarina Rd to Inter. Reynolds St & Cemetery Access Rd	Eastbound (G)	55.18	2007	120.0	3.0	2028.6	18,847,488	20,366,450	19,758,865	2028	18,868,360	20,388,561	2028.6	0.0	No
20	Peak Downs Hwy (33B)	(20) - Inter. Reynolds St & Cemetery Access Rd to Inter. Oxford Downs - Sarina Rd	Westbound (A)	55.18	2007	120.0	3.0	2028.6	18,484,411	19,970,729	19,376,202	2028	18,558,261	20,048,783	2028.5	0.1	No
21	Peak Downs Hwy (33B)	(21) - Inter. Reynolds St & Cemetery Access Rd to Denison Ck Bridge	Eastbound (G)	63.61	2007	120.0	3.0	2025.8	15,934,651	17,457,311	17,152,779	2025	15,951,805	17,475,704	2025.8	0.0	No
22	Peak Downs Hwy (33B)	(22) - Denison Ck Bridge to Inter. Reynolds St & Cemetery Access Rd	Westbound (A)	63.61	2007	120.0	3.0	2025.8	15,989,057	17,513,591	17,208,685	2025	16,050,293	17,579,032	2025.8	0.0	No
23	Peak Downs Hwy (33B)	(23) - Denison Ck Bridge to Inter. Eton - Homebush Rd	Eastbound (G)	57.12	2007	120.0	3.0	2028.0	20,437,762	22,084,987	20,437,762	2027	18,858,069	20,458,634	2028.0	0.0	No
24	Peak Downs Hwy (33B)	(24) - Inter. Eton - Homebush Rd to Denison Ck Bridge	Westbound (A)	57.12	2007	120.0	3.0	2028.0	11,994,382	12,847,160	11,994,382	2027	11,235,820	12,068,232	2027.9	0.1	No
25	Peak Downs Hwy (33B)	(25) - Inter. Eton - Homebush Rd to Camerons Rd	Eastbound (G)	56.57	2007	120.0	3.0	2028.1	14,966,103	16,033,123	15,072,805	2028	14,986,975	16,055,234	2028.1	0.0	No
26	Peak Downs Hwy (33B)	(26) - Camerons Rd to Inter. Eton - Homebush Rd	Westbound (A)	56.57	2007	120.0	3.0	2028.1	13,152,768	14,088,192	13,246,311	2028	13,226,618	14,166,246	2028.0	0.1	No
27	Peak Downs Hwy (33B)	(27) - Camerons Rd to Inter. Mackay - Eungella Rd	Eastbound (G)	60.43	2007	120.0	3.0	2026.9	14,055,937	15,150,005	15,040,599	2026	14,074,330	15,169,638	2026.9	0.0	No
28	Peak Downs Hwy (33B)	(28) - Inter. Mackay - Eungella Rd to Camerons Rd	Westbound (A)	60.43	2007	120.0	3.0	2026.9	14,247,263	15,354,219	15,243,523	2026	14,312,704	15,423,864	2026.8	0.1	No

Figure B.3

Cardno Eppell Olsen

Projected Annual Maintenance Costs

Link		Section	Direction	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	Peak Downs Hwy (33A)	(1) - Inter. Gregory Development Rd to Caval Ridge Mine Access	Eastbound (G)	$439,669	$470,445	$503,377	$538,613	$576,316	$616,658	$659,824	$706,012	$755,432	$808,313
2	Peak Downs Hwy (33A)	(2) - Caval Ridge Mine Access to Inter. Gregory Development Rd	Westbound (A)	$439,669	$470,445	$503,377	$538,613	$576,316	$616,658	$659,824	$706,012	$755,432	$808,313
3	Peak Downs Hwy (33A)	(3) - Caval Ridge Mine Access to Inter. Dysart Rd	Eastbound (G)	$28,041	$30,004	$32,104	$34,351	$36,756	$39,329	$42,082	$45,027	$48,179	$51,552
4	Peak Downs Hwy (33A)	(4) - Inter. Dysart Rd to Caval Ridge Mine Access	Westbound (A)	$28,041	$30,004	$32,104	$34,351	$36,756	$39,329	$42,082	$45,027	$48,179	$51,552
5	Peak Downs Hwy (33A)	(5) - Inter. Dysart Rd to Inter. Moranbah Access Rd	Eastbound (G)	$9,097	$9,734	$10,415	$11,144	$11,924	$12,759	$13,652	$14,608	$15,630	$16,724
6	Peak Downs Hwy (33A)	(6) - Inter. Moranbah Access Rd to Inter. Dysart Rd	Westbound (A)	$9,097	$9,734	$10,415	$11,144	$11,924	$12,759	$13,652	$14,608	$15,630	$16,724
7	Peak Downs Hwy (33A)	(7) - Inter. Moranbah Access Rd to Old Belyando/Nebo Shire Boundary	Eastbound (G)	$72,264	$77,322	$82,735	$88,526	$94,723	$101,354	$108,448	$116,040	$124,163	$132,854
8	Peak Downs Hwy (33A)	(8) - Old Belyando/Nebo Shire Boundary to Inter. Moranbah Access Rd	Westbound (A)	$72,264	$77,322	$82,735	$88,526	$94,723	$101,354	$108,448	$116,040	$124,163	$132,854
9	Peak Downs Hwy (33A)	(9) - Old Belyando/Nebo Shire Boundary to No Marker	Eastbound (G)	$79,833	$85,422	$91,401	$97,799	$104,645	$111,971	$119,808	$128,195	$137,169	$146,771
10	Peak Downs Hwy (33A)	(10) - No Marker to Old Belyando/Nebo Shire Boundary	Westbound (A)	$79,833	$85,422	$91,401	$97,799	$104,645	$111,971	$119,808	$128,195	$137,169	$146,771
11	Peak Downs Hwy (33A)	(11) - No Marker to Daunia Turnout	Eastbound (G)	$77,496	$82,921	$88,726	$94,936	$101,582	$108,693	$116,301	$124,442	$133,153	$142,474
12	Peak Downs Hwy (33A)	(12) - Daunia Turnout to No Marker	Westbound (A)	$77,496	$82,921	$88,726	$94,936	$101,582	$108,693	$116,301	$124,442	$133,153	$142,474
13	Peak Downs Hwy (33A)	(13) - Daunia Turnout to Thirty Mile Ck	Eastbound (G)	$65,444	$70,025	$74,926	$80,171	$85,783	$91,788	$98,213	$105,088	$112,444	$120,315
14	Peak Downs Hwy (33A)	(14) - Thirty Mile Ck to Daunia Turnout	Westbound (A)	$65,444	$70,025	$74,926	$80,171	$85,783	$91,788	$98,213	$105,088	$112,444	$120,315
15	Peak Downs Hwy (33A)	(15) - Thirty Mile Ck to Inter. Fitzory Development Rd	Eastbound (G)	$85,430	$91,410	$97,808	$104,655	$111,981	$119,819	$128,207	$137,181	$146,784	$157,059
16	Peak Downs Hwy (33A)	(16) - Inter. Fitzory Development Rd to Thirty Mile Ck	Westbound (A)	$85,430	$91,410	$97,808	$104,655	$111,981	$119,819	$128,207	$137,181	$146,784	$157,059
17	Peak Downs Hwy (33A)	(17) - Inter. Fitzory Development Rd to Inter. Oxford Downs - Sarina Rd	Eastbound (G)	$89,957	$96,254	$102,992	$110,202	$117,916	$126,170	$135,002	$144,452	$154,563	$165,383
18	Peak Downs Hwy (33A)	(18) - Inter. Oxford Downs - Sarina Rd to Inter. Fitzory Development Rd	Westbound (A)	$89,957	$96,254	$102,992	$110,202	$117,916	$126,170	$135,002	$144,452	$154,563	$165,383
19	Peak Downs Hwy (33B)	(19) - Inter. Oxford Downs - Sarina Rd to Inter. Reynolds St & Cemetery Access Rd	Eastbound (G)	$92,231	$98,687	$105,595	$112,987	$120,896	$129,359	$138,414	$148,103	$158,470	$169,563
20	Peak Downs Hwy (33B)	(20) - Inter. Reynolds St & Cemetery Access Rd to Inter. Oxford Downs - Sarina Rd	Westbound (A)	$92,231	$98,687	$105,595	$112,987	$120,896	$129,359	$138,414	$148,103	$158,470	$169,563
21	Peak Downs Hwy (33B)	(21) - Inter. Reynolds St & Cemetery Access Rd to Denison Ck Bridge	Eastbound (G)	$185,399	$198,377	$212,264	$227,122	$243,021	$260,032	$278,235	$297,711	$318,551	$340,849
22	Peak Downs Hwy (33B)	(22) - Denison Ck Bridge to Inter. Reynolds St & Cemetery Access Rd	Westbound (A)	$185,399	$198,377	$212,264	$227,122	$243,021	$260,032	$278,235	$297,711	$318,551	$340,849
23	Peak Downs Hwy (33B)	(23) - Denison Ck Bridge to Inter. Eton - Homebush Rd	Eastbound (G)	$244,955	$262,102	$280,449	$300,081	$321,086	$343,562	$367,612	$393,344	$420,879	$450,340
24	Peak Downs Hwy (33B)	(24) - Inter. Eton - Homebush Rd to Denison Ck Bridge	Westbound (A)	$244,955	$262,102	$280,449	$300,081	$321,086	$343,562	$367,612	$393,344	$420,879	$450,340
25	Peak Downs Hwy (33B)	(25) - Inter. Eton - Homebush Rd to Camerons Rd	Eastbound (G)	$109,648	$117,324	$125,536	$134,324	$143,726	$153,787	$164,552	$176,071	$188,396	$201,584
26	Peak Downs Hwy (33B)	(26) - Camerons Rd to Inter. Eton - Homebush Rd	Westbound (A)	$109,648	$117,324	$125,536	$134,324	$143,726	$153,787	$164,552	$176,071	$188,396	$201,584
27	Peak Downs Hwy (33B)	(27) - Camerons Rd to Inter. Mackay - Eungella Rd	Eastbound (G)	$33,352	$35,686	$38,184	$40,857	$43,717	$46,777	$50,052	$53,555	$57,304	$61,315
28	Peak Downs Hwy (33B)	(28) - Inter. Mackay - Eungella Rd to Camerons Rd	Westbound (A)	$33,352	$35,686	$38,184	$40,857	$43,717	$46,777	$50,052	$53,555	$57,304	$61,315